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August, 1957

THE JOURNAL OF GLASS MANUFACTURING

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the glass industry

V. 3 A
#8

• • • J. A. Stapp and T. J. Mahoney (foreground) adjust silicone emulsion feed to nozzles for blank mold spray during controlled experiments at Wheaton plant. *See page 433.*

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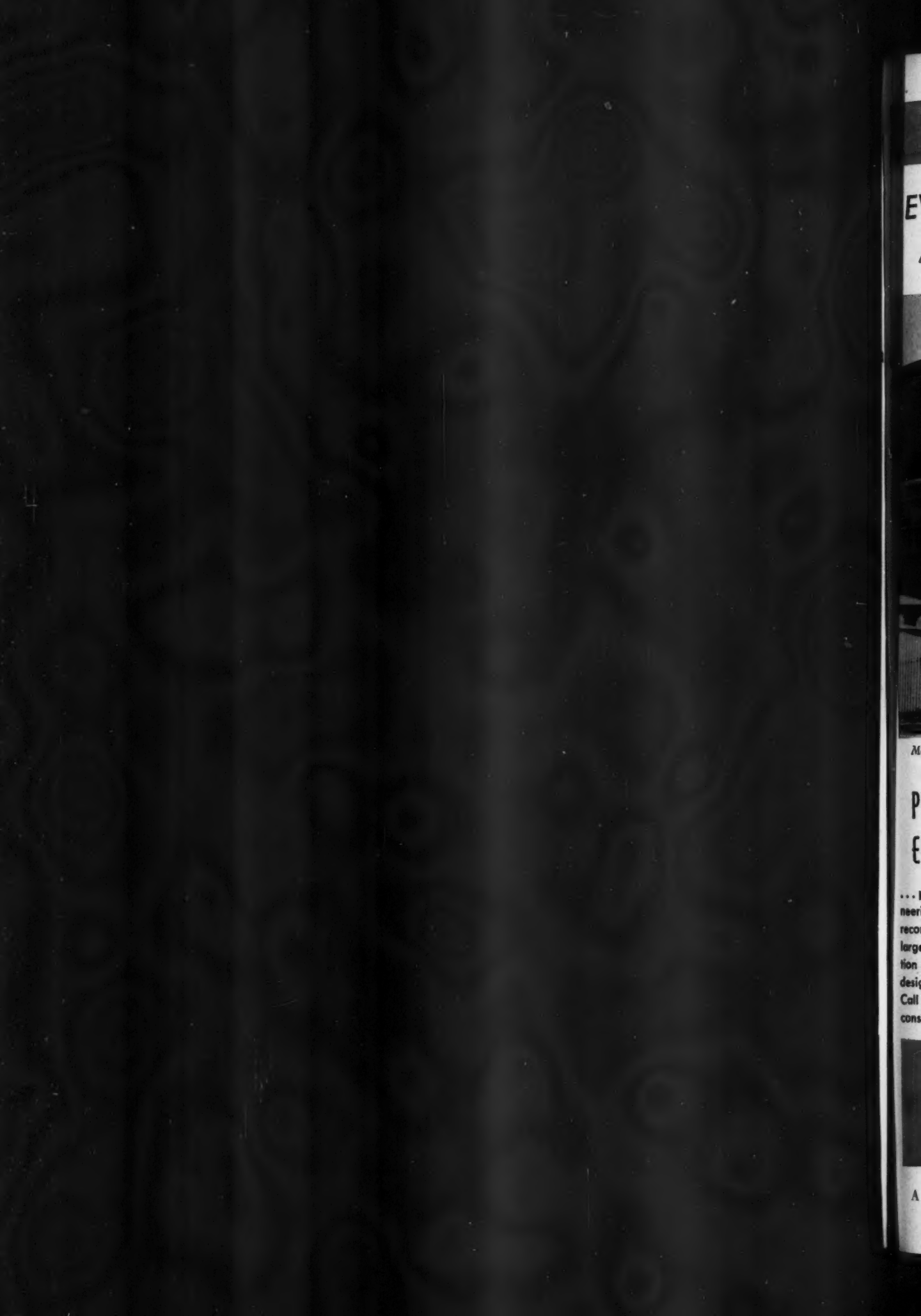

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the glass industry

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P. C. E. Cone 17-18

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Fe_2O_3	0.86%
TiO_2	0.86%
CaO	0.06%
MgO	0.09%
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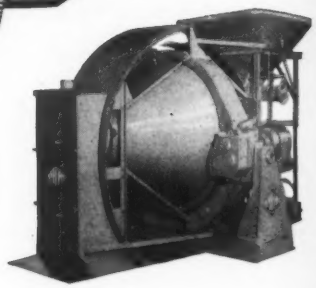

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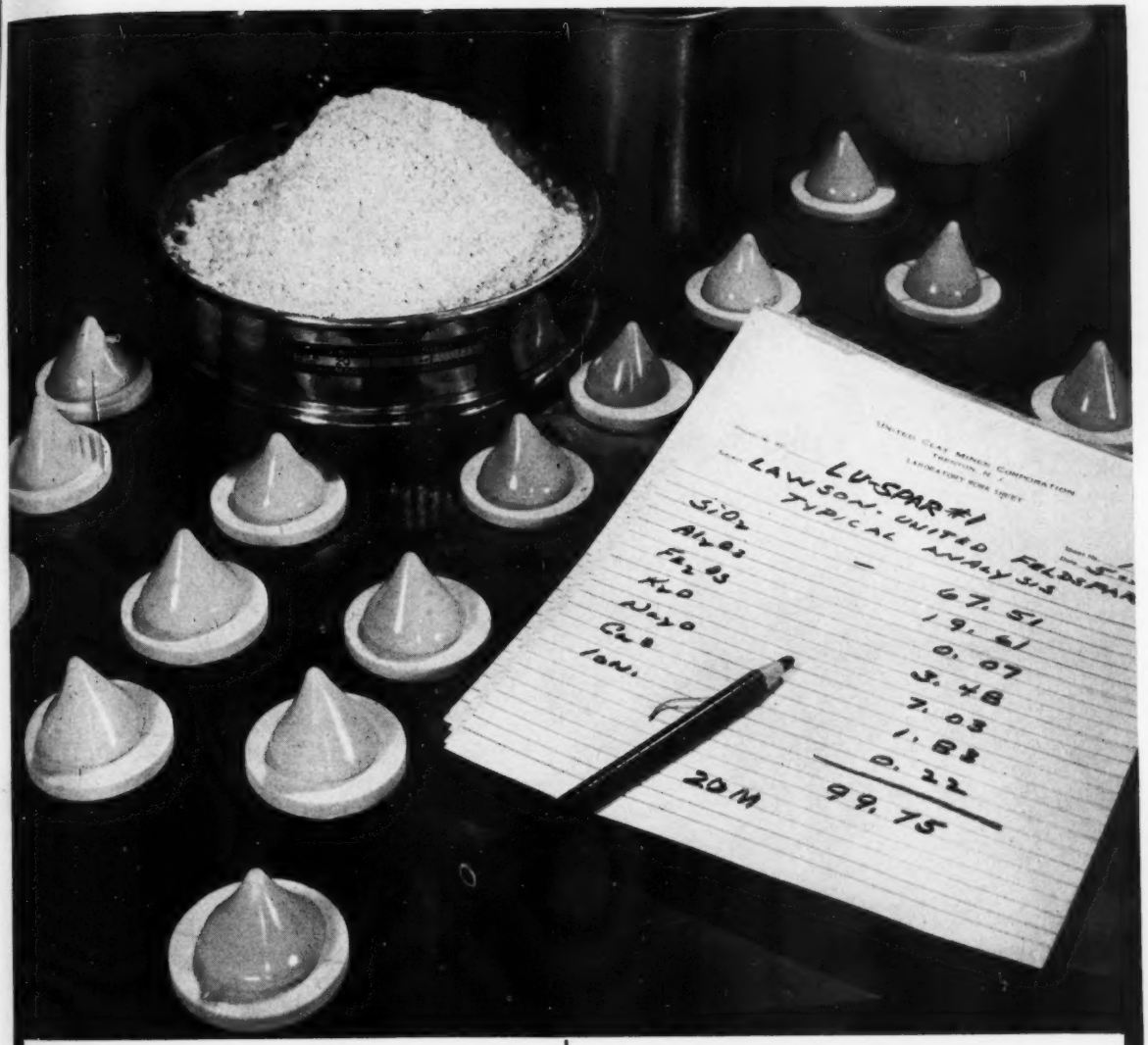

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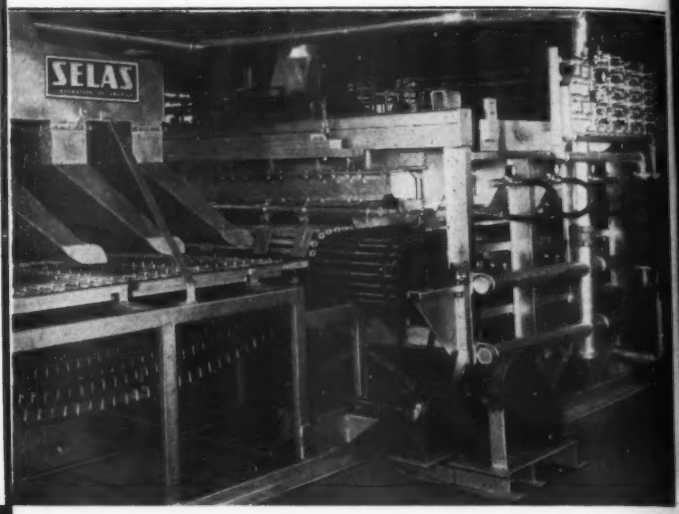

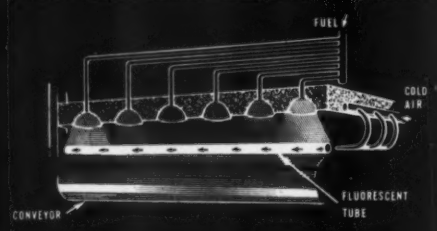

Phosphor coating is baked and oxidized in this Selas-designed, Selas-built tunnel lehr accommodating fluorescent tubes up to 48 in. Duradiant® burners are individually regulated to produce the heat pattern necessary to meet nonuniform heat requirements accentuated by introduction of cold air through the tubes. Result is tube temperature controlled within ±5°F. Tubes, heated quickly to glass-softening point, emerge dimensionally accurate from lehr, then pass through controlled cooling stations. Capacity is 1000 tubes per hr.

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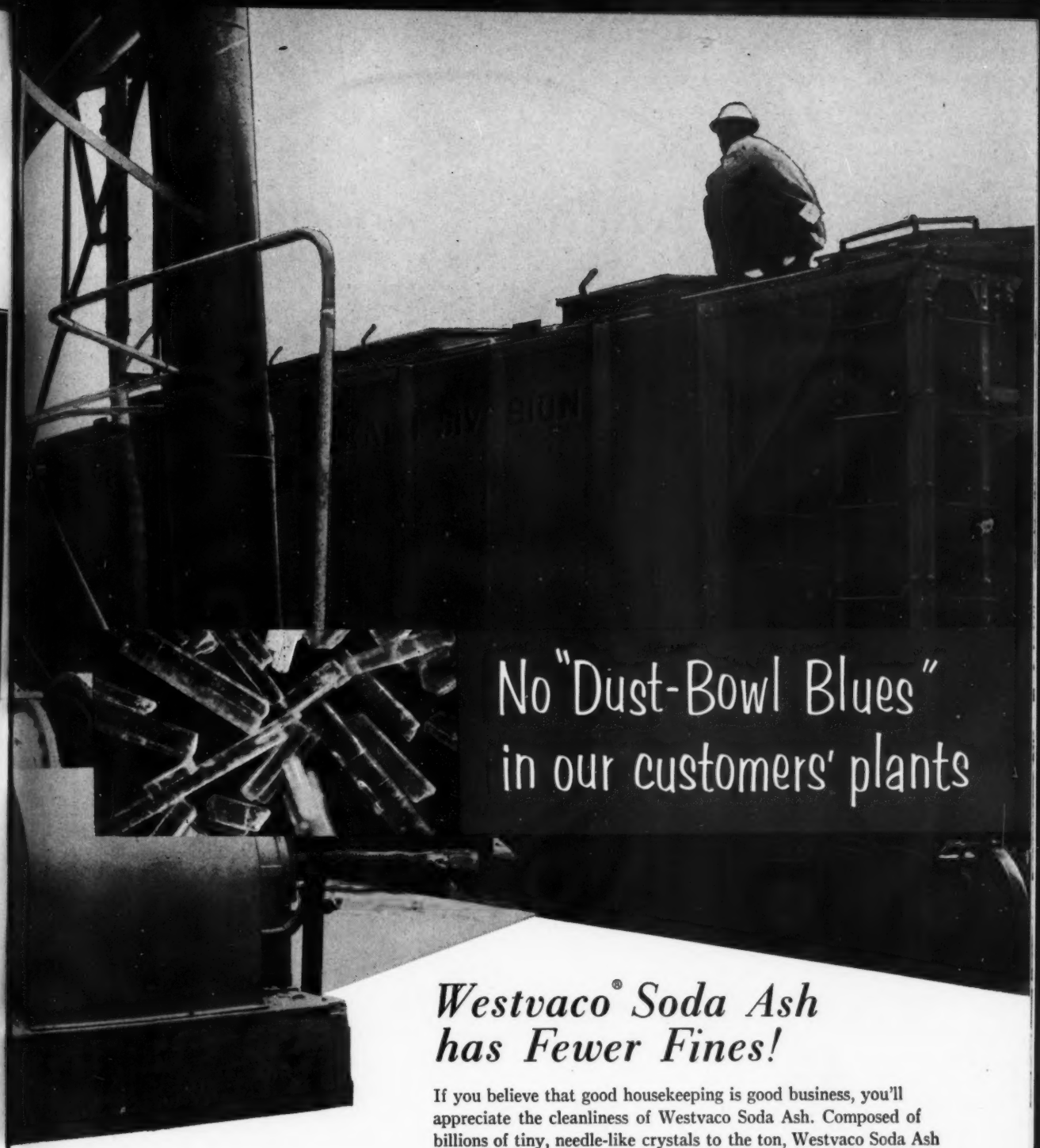

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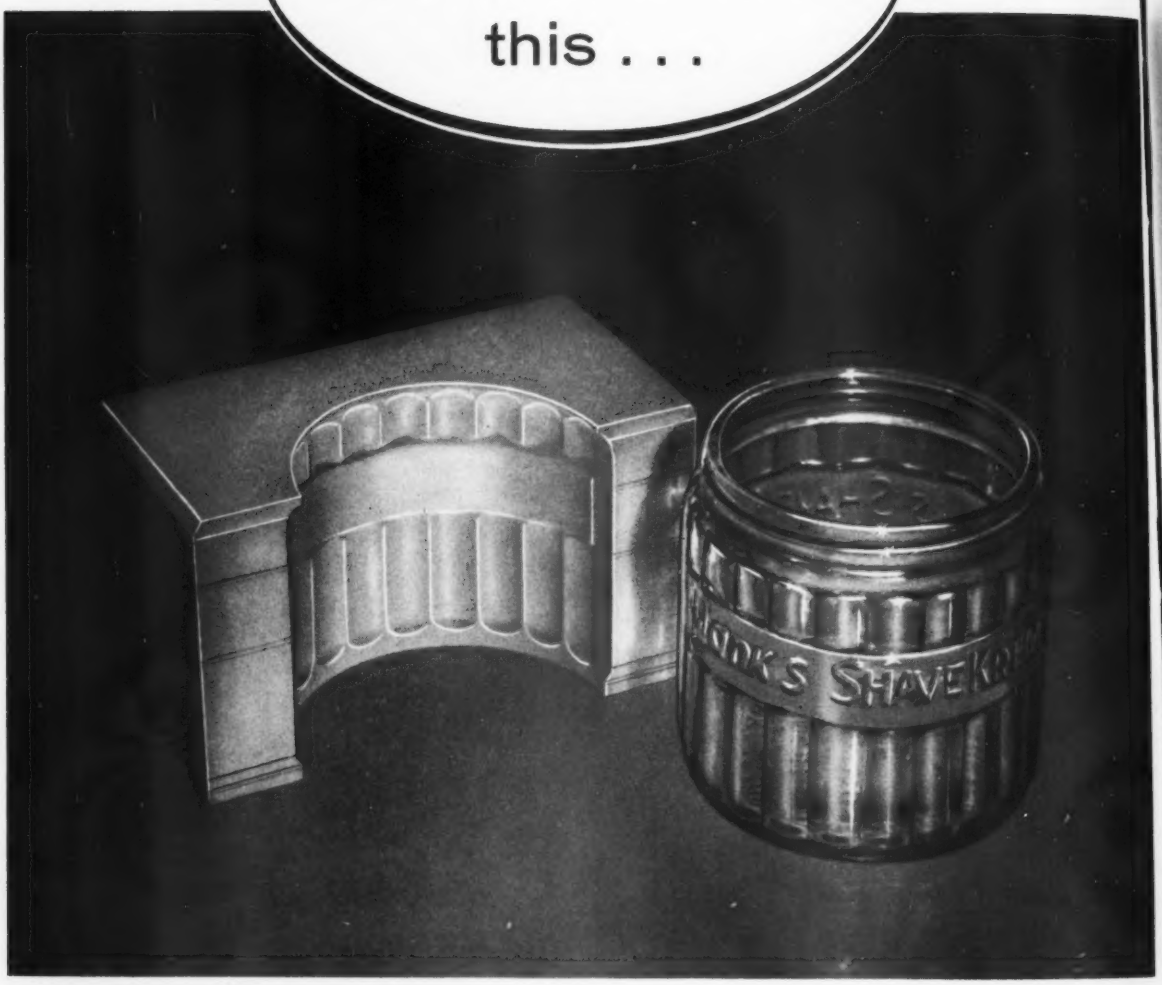
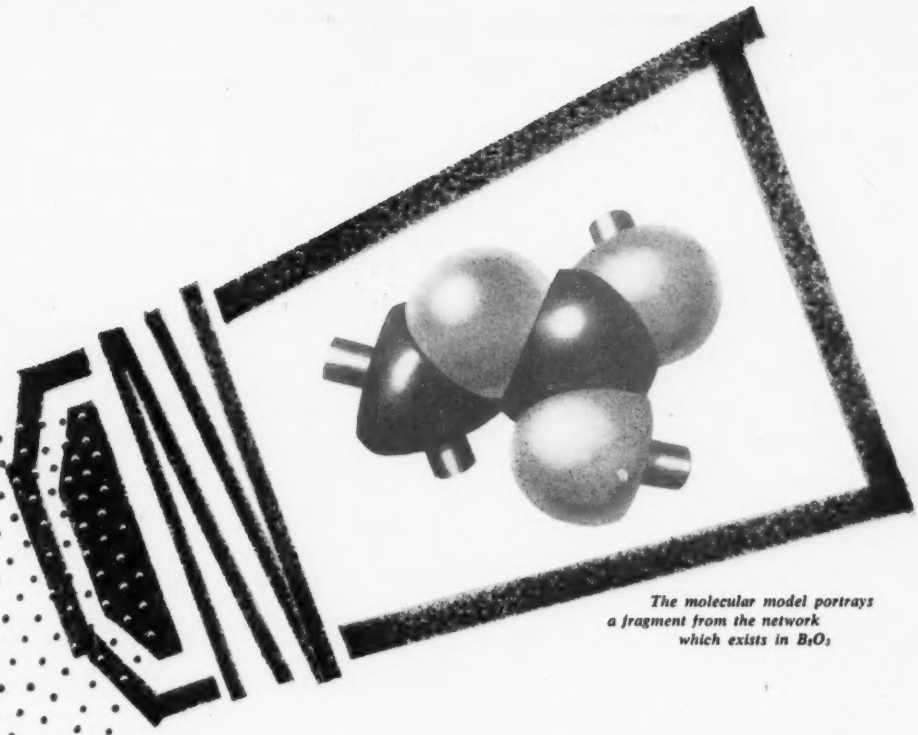


No Sir! It took a long time, many experiments, and a lot of skill to perfect a permanent material for a duplicator master . . . but Overmyer stayed with it! And now all the exacting measurements of a glass container mould stay dimensionally correct, because this exclusive Overmyer material won't warp, shrink, expand, nor deteriorate in storage. This material assures uniformity whether two or twenty moulds are produced . . . eliminates completely the chance of variation by human hand. Overmyer craftsmen, with their long-accumulated skill and experience, now use this material in duplicating moulds, to save time and assure quality for their customers. Another example of Overmyer research, a constant day-by-day effort to find new and better ways to serve the glass industry.

Overmyer Mould Company, Inc., Winchester, Indiana; Greensburg, Pennsylvania; South Gate, California; Fremont, Indiana.



The molecular model portrays a fragment from the network which exists in B_2O_3

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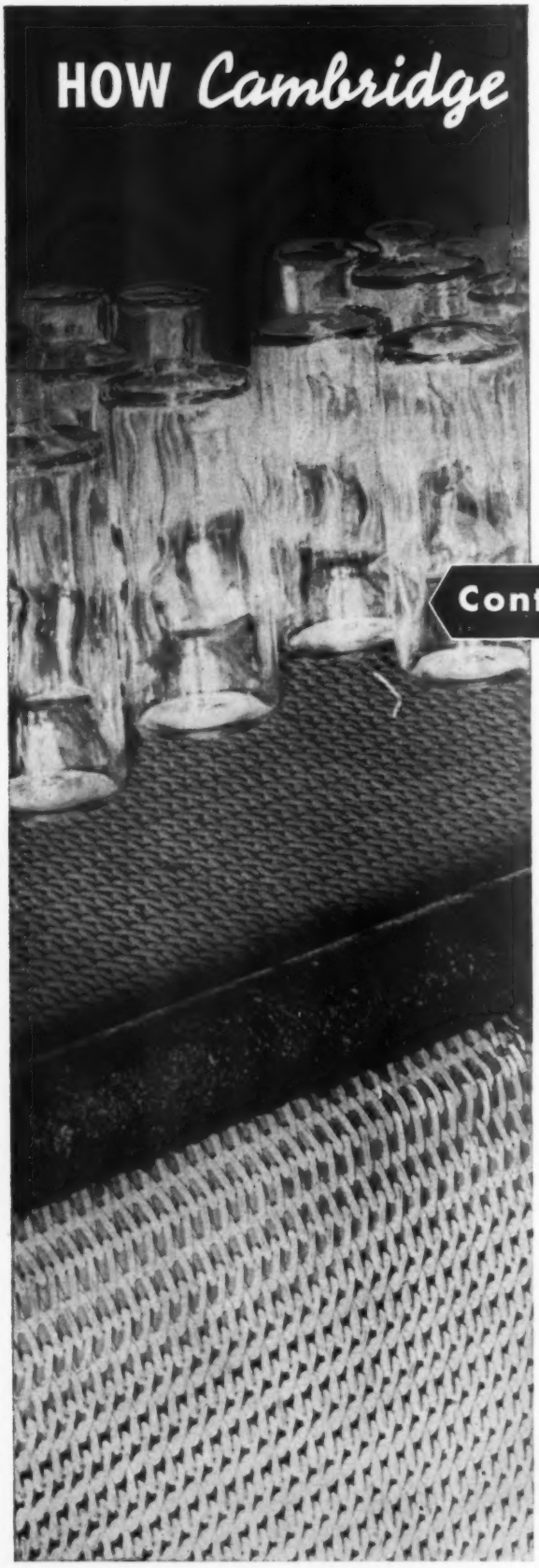

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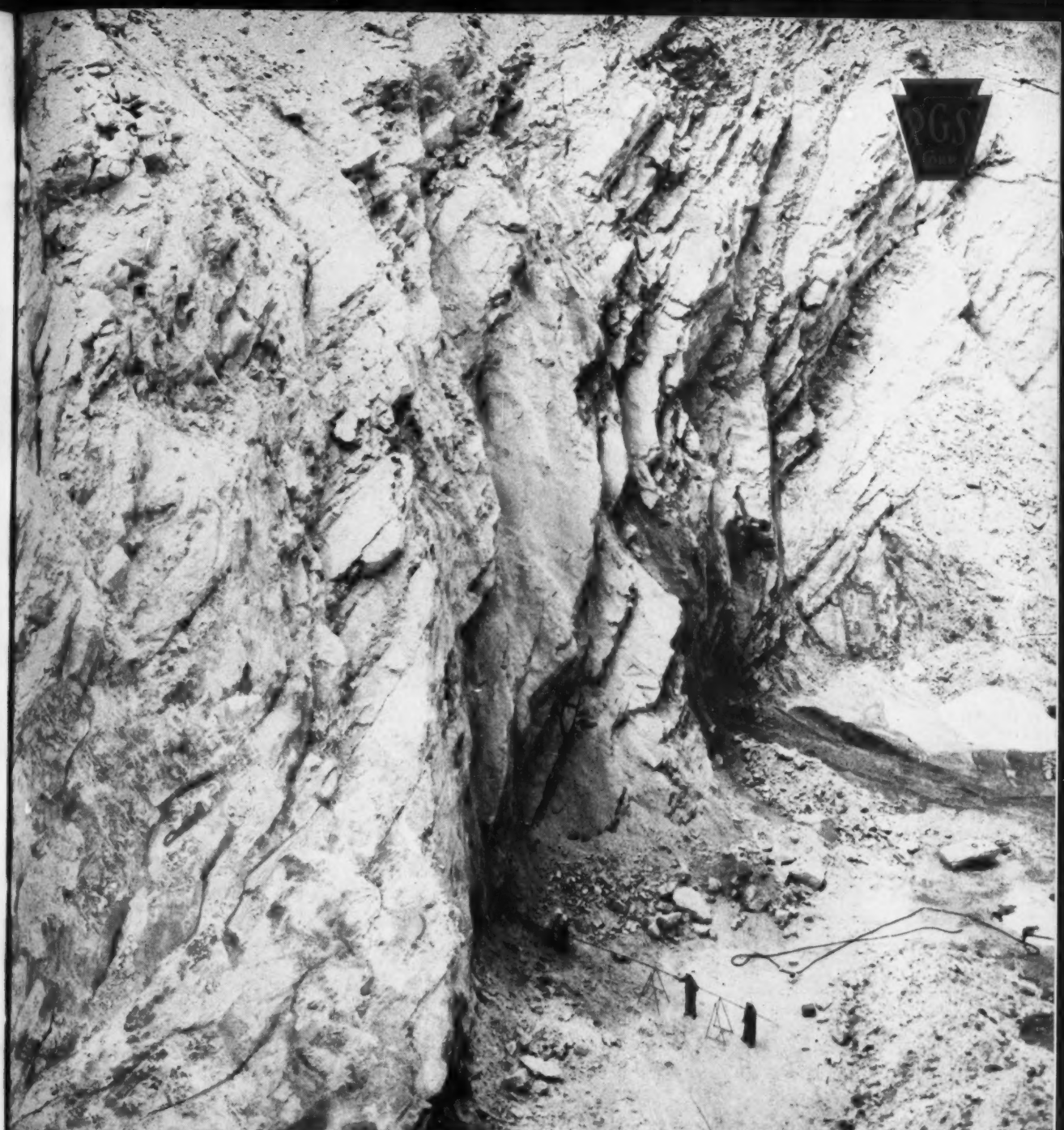

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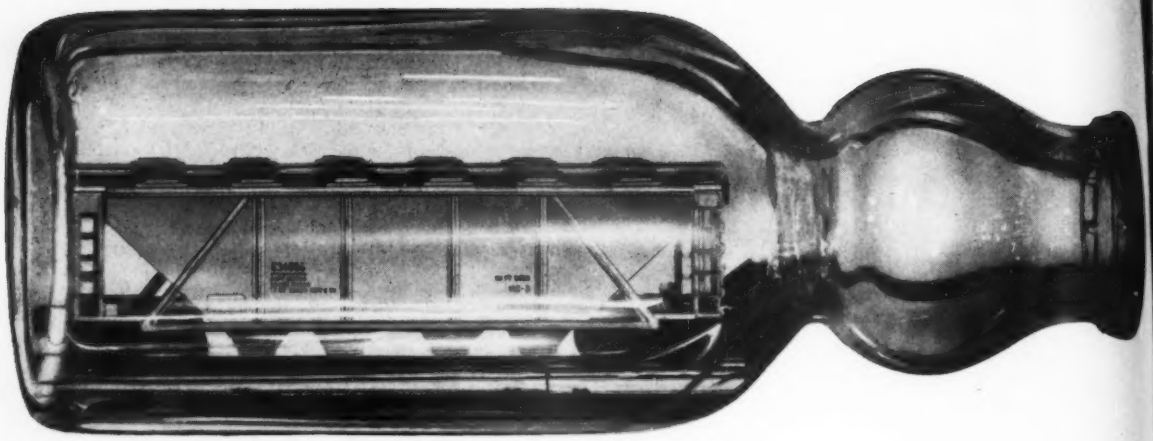

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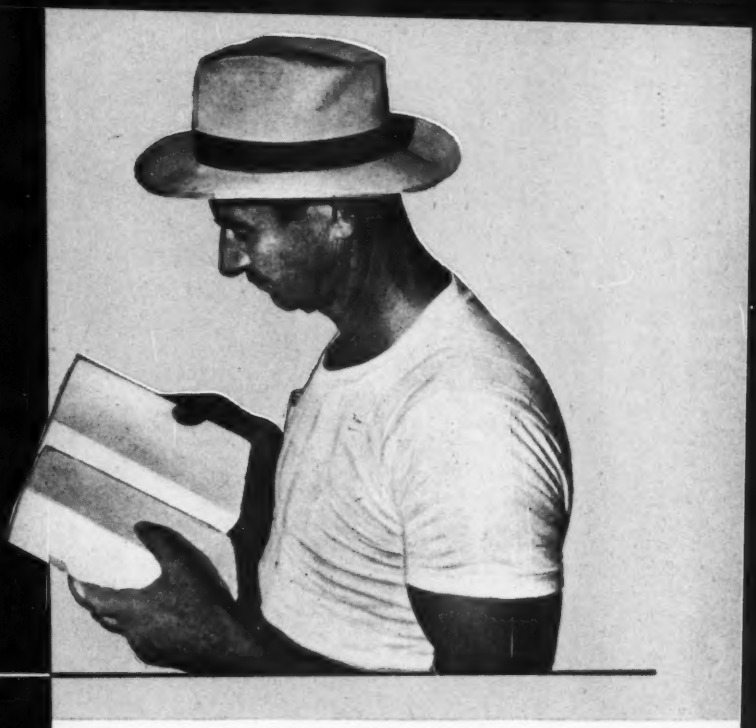

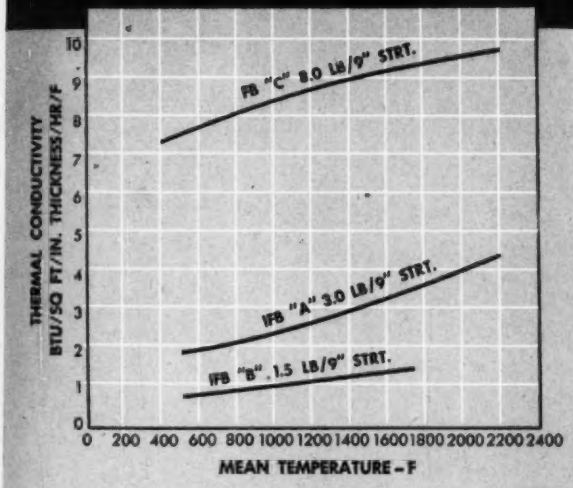

FIG. 1

Thermal Conductivities of Various Weight Refractories

There is a close relationship between the weight of the firebrick and its thermal conductivity. In general, the lower the weight, the lower the conductivity—therefore, the better it is as an insulator.

The chart shows this relationship between two insulating firebrick of 1.5 pounds per 9 inch straight and 3 pounds per 9 inch straight and a fireclay brick weighing from 7½ to 8 pounds per 9 inch straight.

Are you using, or are you planning to use refractory insulation in the construction of your glass melting furnace? If so, avail yourself of *all* the benefits of insulation —get the most for your insulating refractories dollar.

The maximum in insulating value plus the refractoriness needed for the temperature conditions involved are important considerations in the selection of the proper refractory insulation. After weighing these considerations and evaluating different types of materials, many glass manufacturers have selected *lightweight* B&W Insulating Firebrick to provide these benefits.

Here's why. B&W Insulating Firebrick are *lighter in weight* than any other insulating firebrick, which means they have low conductivity, insulate better (see Figure 1). This reduces radiation, which is lost heat, and results in substantial fuel savings. It also means improved working conditions around the tank, an additional benefit for you and your employees.

Lightweight B&W IFB save in other ways, too. They can be bonded with firebrick walls to reduce air leakage and infiltration, thus further reducing fuel consumption.

B&W Kaolite for Forehearth Channels

For quick, easy installation, B&W Kaolite is recommended for insulating sidewall and bottom forehearth channels. This lightweight insulating castable not only goes in fast, but also provides excellent insulating properties.

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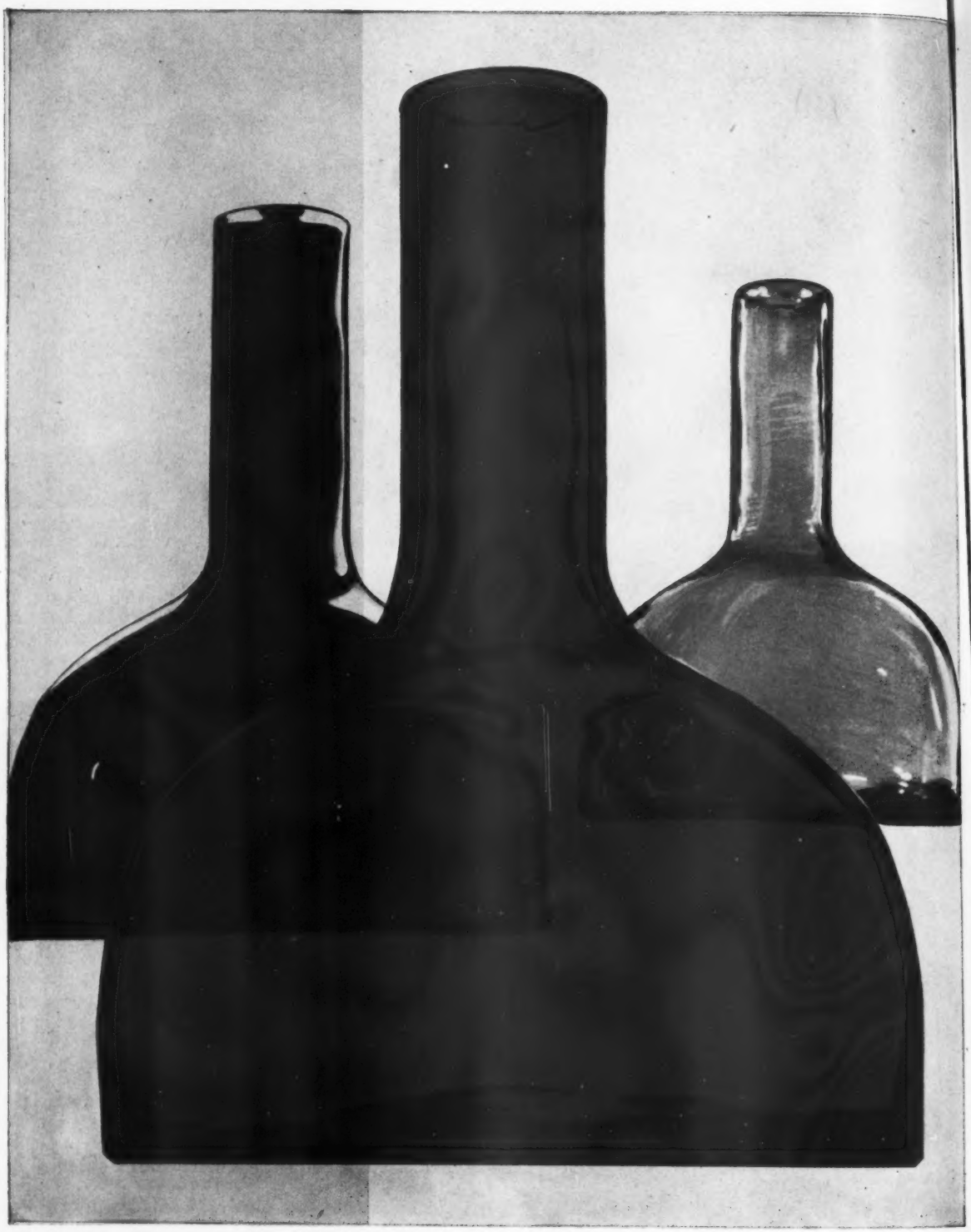

Columbia-Southern, a dependable supplier of soda ash to the glass industry since 1899, manufactures its soda ash with extreme care to conform with the characteristics of other raw materials for superior glassmaking

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the glass industry
VOLUME 38, NUMBER 8, AUGUST, 1957

A Report on the Use of Silicone Lubricants at Wheaton Glass Company

By THOMAS W. BAILEY, Process Engineer
Wheaton Glass Company, Millville, New Jersey

Introduction

• THE USE OF SILICONE emulsions on glass forming machine delivery equipment has become quite widespread. The use of silicones on blank molds has been slower to develop. The main reason for this has been improper application of the silicones. Until now spray equipment available was unsatisfactory for one reason or another. Drawbacks of past spray equipment have been: lack of proper atomization (silicones must be misted on), inability of the spray to overcome wind resistance and actually coat the blank mold, and lack of proper spray system design to take full advantage of the aqueous silicone system.

Realizing this, the Silicones Division of Union Carbide Corporation arranged with the Wheaton Glass Company, Millville, New Jersey for the use of a five section Hartford Empire I.S. Machine under actual plant production conditions for two weeks. The purpose was to work out a suitable blank spray method and also determine the best silicone to use.

Five different spray methods were evaluated for application of silicones to blank molds.

Using the best spray methods found, five different materials were evaluated to find the best material.

Following this evaluation the machine was run for two weeks with the best spray method and materials. During this period blank swabbing was decreased and accurate consumption figures were developed.

Table I shows a log of the two weeks operation.

Throughout the tests Union Carbide LE-45 was used on shear blades, scoops and deflectors.

Machine Setup

Prior to the start of these tests, the spray devices were mocked up and tested on an idle machine. The sprays were then transferred to the machine used during a job change.

Fig. 1 shows schematically the five spray systems installed on the machines.

Two nozzles were installed on section 1 spraying from beneath the blank mold. One nozzle was mounted beneath each half of the blank and positioned so that it sprayed up through the finish and along the sides of the blank.

On section 2, two nozzles were mounted directly in front of the invert post. Each half of the blank mold was covered by one of the nozzles.

On section 3, two nozzles were mounted above the blank. Each half of the blank mold was sprayed by a nozzle pointed downward along the mold face.

On section 4, two nozzles were mounted one on each side, outside the invert arm. Each spray was directed at the open blank molds.

On section 5 was mounted a mist spray unit which introduced silicone emulsion into the blowback air and sprayed it up through the thimble into the blank.

Existing spray equipment on the machine was used for the application of LE-45 to the shears, scoops and deflectors. These are pictured in Figs. 2, 3 and 4.

Determination of the Best Spray

The machine was run normally and every attempt was made to operate so that the only difference between sections was the type of spray application. The five methods of spray described above were tested and the following silicone lubricants were used throughout this test:

Shears: 200:1 Union Carbide LE-45
(90 CC LE-45—5 gal. water)

Delivery: 200:1 Union Carbide LE-45 (90 CC LE-45—⅓ oz. sodium nitrite, 5 gal. water (Scoops and Deflectors)

Blanks: 80:1 Union Carbide LE-45 (250 CC LE-45—⅓ oz. sodium nitrite, 5 gal. water)

The job run was L-32 as shown in Figs. 5 and 5-A Details of this job were as follows:

Bottle: 16 oz. Tapered cylinder round, Hollywood line—Flint Glass L-32

Weight: 14 ⅝ oz. + ⅛ oz.

Optical Temperature: 2070°F Front
2160°F Back

Swabbing: Normally 20 minute interval on neckrings, blank molds and bottom plates.

Rate: 25/min.

Finish: S/N G.C.M.I. 415-24

It very soon became evident that the underneath spray on section 1 was unsatisfactory for this type of bottle. The finish section of the blank became overheated because the spray could not be directed properly in the

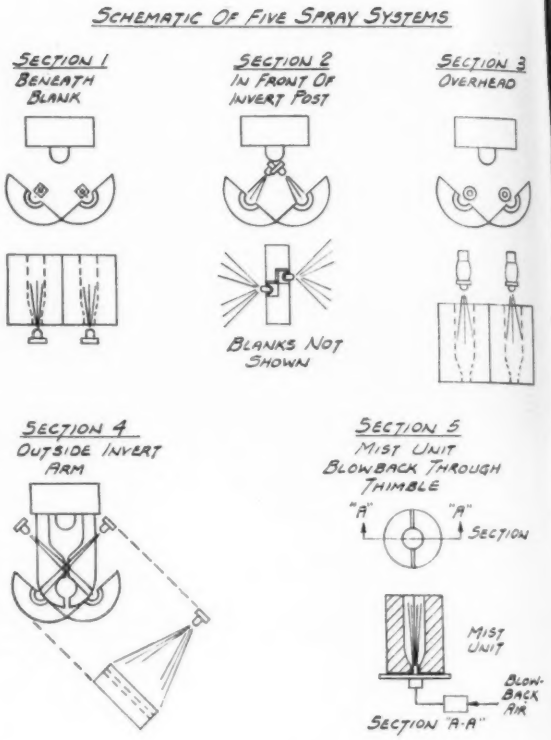


Fig. 1

Table I

February 25 to March 8

Date	Summary	Per Cent Pack
Feb. 25	Start up. Job was L-32.	
26	Down-seeds in glass until 2 AM of 27th.	
27	Comparing spray systems. Five different systems on the machine.	
28	Continued comparison, then changed 1, 2, 4, and 5 sections to invert post spray.	
Mar. 1	12 Noon, began comparison of silicones, LE-45 run to 12 Midnight.	86.7 per cent for LE 45
2	12 Midnight to 12 Noon, LE-451 was run, 12 Noon to 8:30 PM, Graph. IMR	79.8 per cent, LE-451; 68.4 G.I.M.R.
3	9:30 PM Mar. 2 to 12 Noon ran IMR. 12 Noon to 12 Midnight; Delivery only	64.9 per cent, IMR; 75 per cent Del. only
4	Delivery only to 1400. Job change to 138R	48.8 per cent
5	12 M to 1500, Delivery only. Changed nozzles on blanks and started up at 1910 hours	71.2 per cent
6	Operated as recommended—Invert post spray, LE-45 (Section #3-overhead spray)	80.5 per cent
7	Operated as recommended	83.1 per cent
8	Operated as recommended. Job change at 1400 L-137RL U. C. C. Personnel Gone	83.6 per cent, to 1400.
10	Operated as recommended—all invert post spray	86.0 per cent
11	Operated as recommended	86.7 per cent
12	" "	85.9 per cent
13	" " Job change to L-161R, one shift	89.1 per cent; 77.6 per cent
14	L-161R continued	87.1 per cent
15	" "	88 per cent
16	One shift.	72.1 per cent

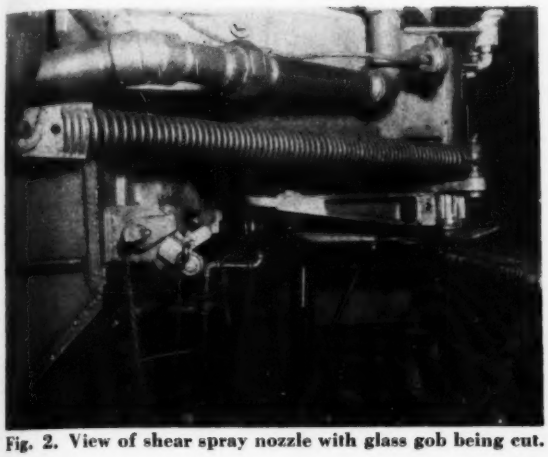


Fig. 2. View of shear spray nozzle with glass gob being cut.

shoulder section. The flat shoulder prevented this. In addition the bracketing needed to hold the spray was rather complicated and therefore hard to build, install and adjust. Furthermore, it would have interfered during job changes. The theory, we believe, is fine and would possibly have merit on blanks with smooth tapered sides such as a soda bottle blank. This spray therefore, was removed and swabbing and paraffin oil were used for blank lubrication.

Also, the spray nozzles mounted outside the invert arm were quickly found to be unsatisfactory. The spray pattern crossed and did not reach the blank mold because of wind interference. There was also too great a distance to span from the nozzle to the blank. An integrating valve was designed to time each spray separately and prevent crossing of the spray patterns. However this was not installed because of its impracticability and the greater promise shown by the invert post spray on section 2. Therefore this spray rig was replaced with another mist unit blowing up through the thimble similar to section 5. This, however was an adjustable mist unit which permitted greater flow of silicone into the system.

At this time the following blank spray units were tested:

Section 1—no silicone on. Blank swabbing or paraffin oil used at operator's discretion.
Section 2—Invert post spray
Section 3—Overhead spray unit
Section 4—High flow mist unit
Section 5—Low delivery mist unit

Of these spray methods section 2, the invert post spray unit, indicated the best results (Table II) and best per cent pack. The ware was segregrated at the cold end of the lehr according to section, therefore permitting the per cent pack per section to be obtained.

Table II

Comparison of Blank Sprays

1200 2/27 to 0900 2/28 21 Hrs.

Section	1	2	3	4	5
Spray	Oil	Invert	O'head	Hi-Mist	Lo-Mist
Dzns. Packed	340	389	294	335	218
Dzns. Theor.	525	525	516	523	514
Per Cent Packed	64.8	74.0	56.9	64.1	42.4

Table III

Comparison of Blank Sprays

1900 2/28 to 0900 3/1 14 Hrs.

Section	1	2	3	4	5
Spray	Invert	Invert	O'head	Invert + Mist	Invert
Dzns. Packed	242	287	283	231	159
Dzns. Theor.	348	350	350	347	333
Per Cent Pack	69.6	82.0	80.6	66.0	48.0

Fig. 3. View of LE-45 spray into scoop.

Since the invert post spray showed superior results and appeared to be most convenient, it was then installed also on sections 1, 4 and 5, pictured in Figs. 6 and 6-A. The mist spray was also retained on section 4.

To recapitulate, sprays for this test reported in Table III were as follows:

Sections 1, 2, 5 invert post spray
Section 3 overhead spray
Section 4 invert post spray plus mist unit

On this run both the invert post and overhead spray looked very good. The invert post sprays on 1, 4 and 5 sections were not up to par but various machine difficulties not related to the silicone were responsible.

It now became more evident that the invert post spray consistently was showing better results on section 2. The

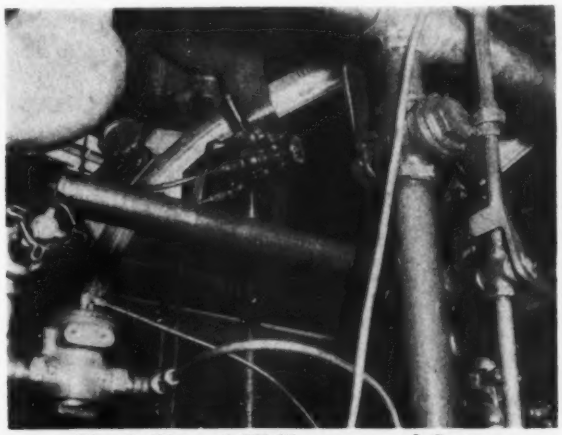


Fig. 4. View of LE-45 spray on deflector.

previous run also indicated that the overhead spray was fairly good, both of these were retained, and the mist unit on section 4 eliminated. We were not satisfied that the mist unit actually put an appreciable quantity into the neck ring.

Table IV shows results of a run where blank spray was as follows:

Fig. 5

Sections 1, 2, 4, 5 invert post spray
Section 3 overhead

It was observed here that sections 1, 4 and 5 came into line with results obtained on section 2. Also the overhead spray seemed adequate.

With regard to the overhead spray on section 3, it was subject to interference from wind around the machine and required some attention to direct spray properly. However, this type spray is simple to install and could be particularly useful in a double gob operation.

Table IV

Comparison of Blank Sprays

0900 3/1 to 2400 3/1

Section	1	2	3	4	5
Spray	Invert	Invert	O'head	Invert	Invert
Dzns. Packed	301	340	307	274	320
Dzns. Theor.	370	371	371	365	375
Per Cent Pack	81.1	91.4	82.6	75.0	85.5

Determination of the Best Material

This phase of testing involved testing five different materials as follows on blanks:

1—Union Carbide LE-45 80:1
2—Union Carbide LE-451 80:1

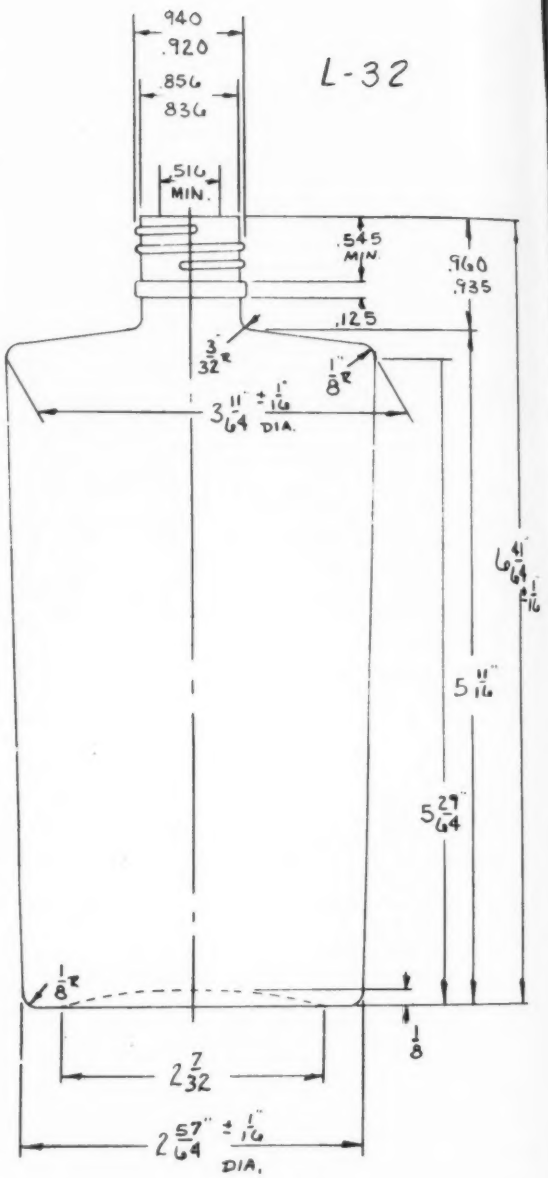


Fig. 5-A

3—Experimental Graphited Silicone Resin Emulsion 64:1
4—Same as 3 but not graphited 64:1
5—No blank lubrication used. Union Carbide LE-45 65:1 on delivery equipment only.

In tests 1—4 the silicone concentration was the same in each case. Each test was planned to run approximately 12 hours. In test 5, 200:1 LE-45 was retained on the shears. In all other cases LE-45 was used on shears, scoops and deflectors.

The spray apparatus consisted of invert post spray on sections 1, 2, 4 and 5 and overhead spray on 3.

Sequential sampling techniques were used in evaluating the ware made during these runs. This data is collected in Table V for LE-45, LE-451 and LE-45 (delivery only).

Table V

Results of Sequential Sampling of Materials Check

Type Defect	Per cent of Defects in each Category		
	LE-45	LE-451	LE-45 Del. Only
Splits	32.2		
Dirty	11.4	20.0	24.4
Blank tears	3.6		
Cut necks	31.6	47.5	26.2
Split finish	2.6	15.8	4.2
Hang ups	6.2		2.2
Checked finish	0.3		6.5
Cold	1.3		
Freak	0.3		
Stone	2.6		
Checked bottom	0.7	6.6	12.0
Heavy mold seam	1.0		
Broken	2.9		
Checked shoulder	2.6	8.9	3.3
Bent neck	0.7		
Checked thread			
Slack thread		0.2	
Dirty finish		0.6	
Checked side		0.4	7.4
Wash boards			0.9
Pushed in sides			12.9
	100.0	100.0	100.0
Per cent pack	86.7	79.1	75.0

The per cent pack figures obtained show that LE-45 was the most effective lubricant, followed by LE-451 and LE-45 on delivery only.

The complete per cent packs were as follows:

LE-45 (80:1)	86.7 per cent
LE-451 (80:1)	79.8 per cent
LE-45 (65:1) (delivery only)	75.0 per cent
Experimental Graphited Silicone Resin Emulsion	68.4 per cent
Non-graphited Silicone Resin Emulsion	64.9 per cent

The resin emulsions did not prove satisfactory because of nozzle clogging and build-up on the blanks.

Machine Run on Best Material, Best Spray

For the balance of the period, approximately 3 days, the machine was run as follows:

Shears: 200:1 LE-45 continued
Delivery: 200:1 LE-45 continued
Blanks: 80:1 LE-45
Blank Spray Equipment: Sections 1, 2, 4, 5 invert post
Section 3 overhead

A new job was put on the machine, L-138-R, Figs. 7 and 7-A and run for five days.

Details on the new job were:
Bottle: 12 oz. Rio Round L-138-R
Finish: S/N G.C.M.I. 414-22
Speed: 33/min.
Swabbing: neck rings, blanks, molds and bottom plates every 15 minutes.

With the spray system and silicone selected, the machine was operated with the object of keeping up the pack and minimizing blank swabbing. An overall per cent pack of 80.9 per cent was attained.

The interval between blank mold swabs was greatly increased as shown in Table VI. Time between swabbings was from 2½ to 6 hours. It was also found that the overhead spray required the most blank mold swabbing. Blank mold changing was also very infrequent compared to normal operation.

Consumption figures were collected for the silicone. These are shown in Table VII.

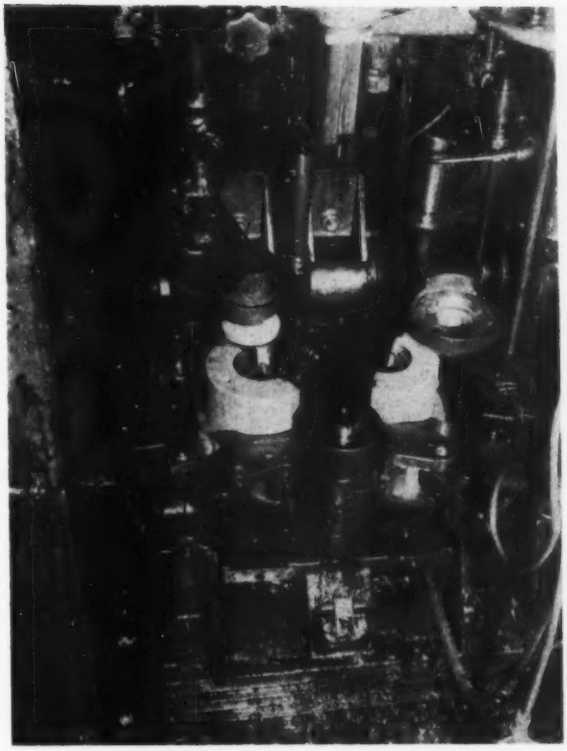


Fig. 6. View of invert post spray device from rear of I. S. machine blank mold in place.

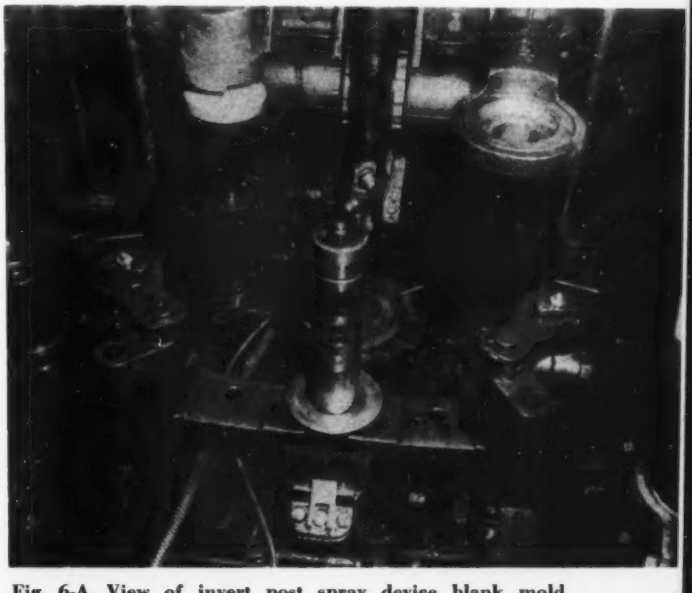


Fig. 6-A. View of invert post spray device blank mold removed.

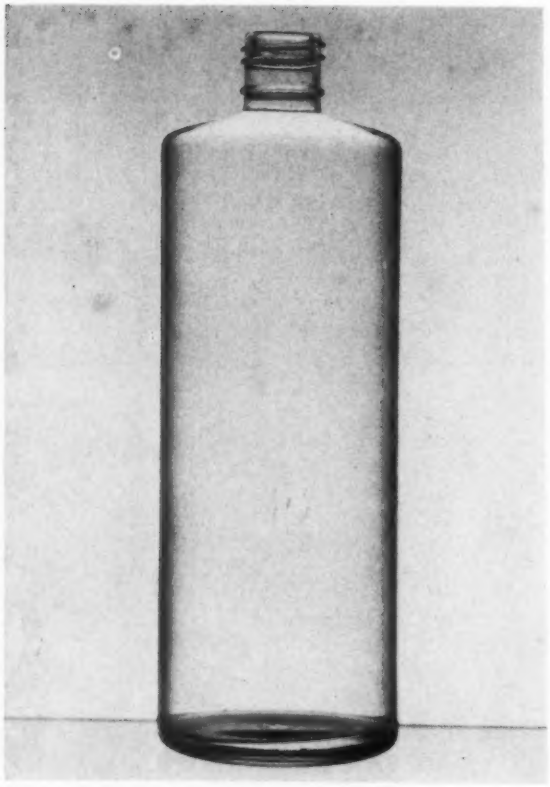


Fig. 7

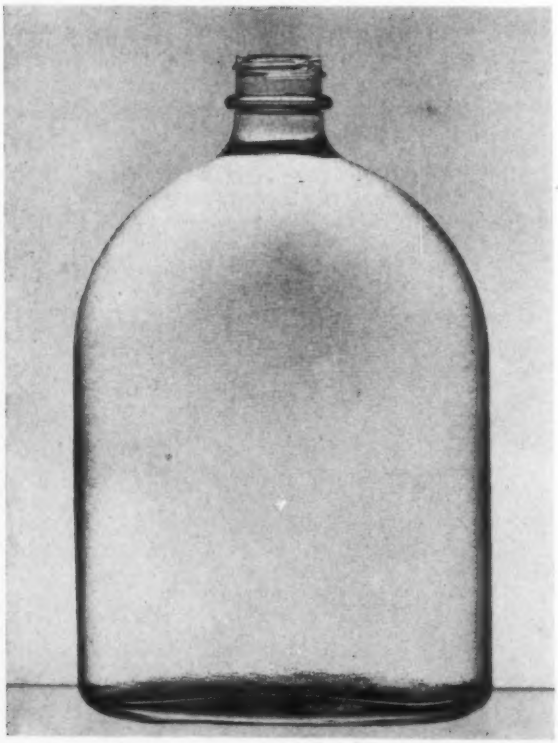


Fig. 8

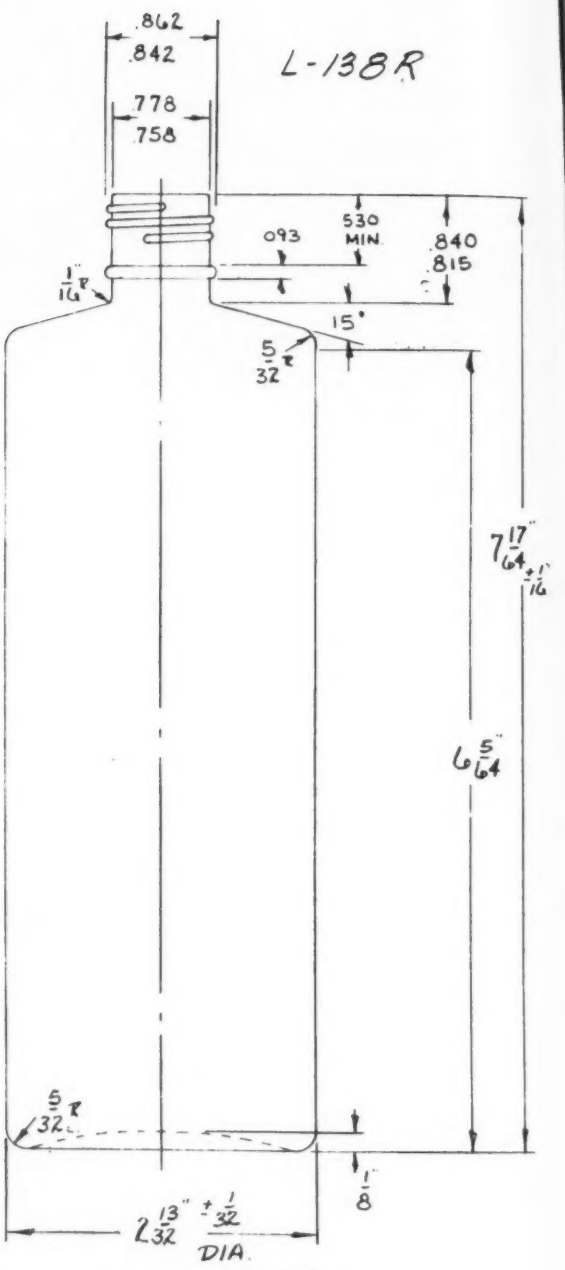


Fig. 7-A

The cost of the silicone lubrication was found to be quite economical at $4.32 per day and compares favorably with the cost of other lubricants.

Table VI

Per Cent Pack, Blank Change, Swabbing Data

67 Hour Run Job L-138R

	Shift		Section				
			1	2	3	4	5
Partial	3/5	4-12	53.6	70.4	83.3	75.8	39.6
	3/6	12-8	67.8	79.1	59.6	74.0	69.2
	3/6	8-4	91.2	84.5	75.0	89.6	67.2
	3/6	4-12	96.0	86.7	90.5	97.5	78.0

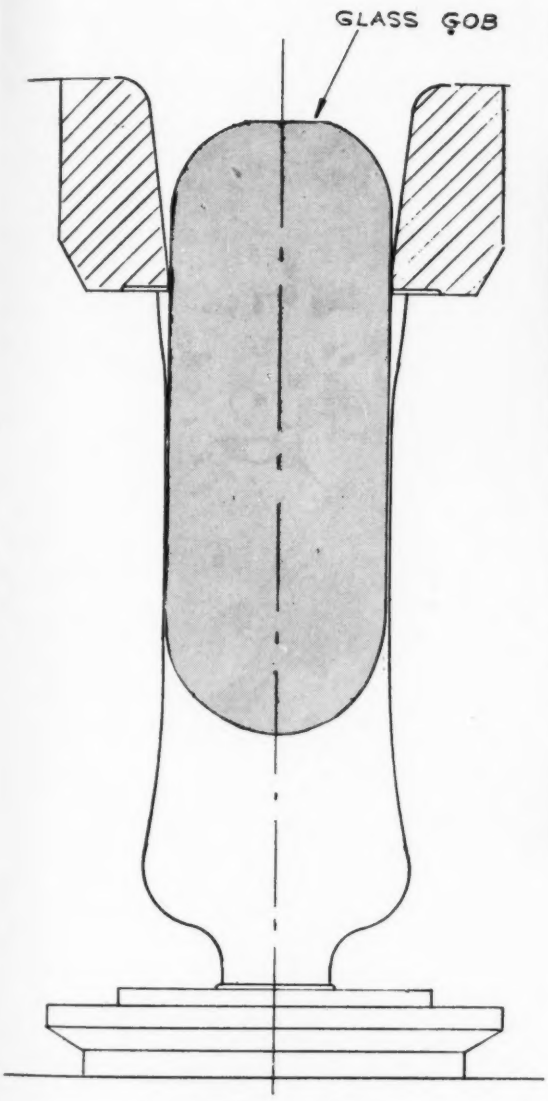


Fig. 9. Blank mold L-32.

	3/7	12-8	92.2	85.2	83.6	90.7	76.2
	3/7	8-4	84.5	88.0	75.7	86.1	59.0
	3/7	4-12	91.8	83.9	81.0	84.9	83.6
	3/8	12-8	91.5	61.9	78.2	92.7	91.5
Partial	3/8	8-4	85.4	69.4	85.3	86.1	91.6
Av. per cent pack			83.7	78.8	79.1	86.4	74.0

Av. overall per cent pack 80.9 per cent

	Section				
	1	2	3	4	5
Blank changes	1	1	3	0	3*
No. blank swabs	15	19	26	11	18
Blank swab freq. in hours	4½	3½	2½	6	3½

*2 changes for misaligned equip.

Table VII

Consumption Silicone per 24 Hour Day

Blank molds	22 gal.	80:1	LE-45 @	12.1¢	$2.66
Delivery	13 gal.	200:1	LE-45 @	4.9¢	0.64
Shears	21 gal.	200:1	LE-45 @	4.9¢	1.02

Total cost $4.32

Fig. 10

Comparison Per Cent Packs With Previous Experience

Our per cent pack on both the L-32 and L-138-R jobs compared favorably with previous experience as shown in Tables VIII and IX.

Table VIII

Previous Experience L-32 Job

L-32	Per Cent Pack	
2-21-57 (prior to start of our run)	76.0	
2-22-57	48.7	
2-23-57	77.4	
2-24-57	89.7	
1-18-57	59.2	
1-19-57	81.8	
1-20-57	88.4	79.0 per cent
1-21-57	75.8	
1-22-57	85.2	
1-23-57	83.7	
3-23 to 3-25-56	63.4	
5-25 to 6-1-56	65.6	
9-18 to 9-21-56	82.6	
LE-45 (Sequential sampling our run)	86.7	

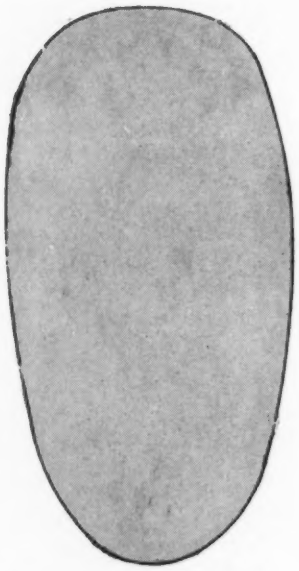


Fig. 10-A. Approximate gob shape for M-112.

Table IX

Previous Experience Job L 138 R

1-29-57	74.8	
1-30-57	91.4	
1-3 -57	84.9	Av. 82 per cent
2-1 -57	86.9	
2-2 -57	77.0	
2-24 to 2-28-56	75.7	
7-23 to 7-27-56	87.3	
Our 67 hr. run	80.9	

Shear Blade Lubrication

Silicones did an excellent job. No blades were changed at all compared to frequent changes normally.

Delivery Equipment Lubrication

This also was uneventful since silicones did an excellent job. Visually the job speed appeared faster than normally observed for "dry" delivery.

It was found that undiluted LE-45 was a good break-in agent for starting up the delivery equipment on silicones. The LE-45 was swabbed into the chute and deflectors at start up.

Experience At End of Test

Near the end of the test there was a job change to job L-137RL (Fig. 8) and at this time all invert post sprays were by then installed and the machine turned back to the plant for continued operation with silicones. Experience since that time has been good and is indicated in Table I for the two subsequent jobs.

It was demonstrated that the silicones lubricant used, UC LE-45, is excellent for shears, scoops, deflectors and blanks. Further, the use of silicones on the blank eliminates smoke and greatly decreases blank swabbing and blank changes. A unique and novel blank application method in the invert post spray was developed.

In summing up Wheaton's production experience with the use of silicones, Forrest Kell, Production Manager reports: in addition to the two week period described in this article, we have continued the use of LE-45 in production for three months with these results:

The use of LE-45 on shears and delivery has proven satisfactory in all cases where used.

The invert post spray using LE-45 and water mixed, applied to blanks and neckrings, gives good results on all free loading blanks. Example: L-32 (Fig. 9).

Blanks which are unusually constricted, tending to cause the gob to hang up, have been a problem not yet solved in all cases. Example: M-112. (Figs. 10, 10-A and 10-B). This type of ware represents less than 10 per cent of our total production.

Process Engineering is continuing to develop a blank coating which will be compatible with LE-45.

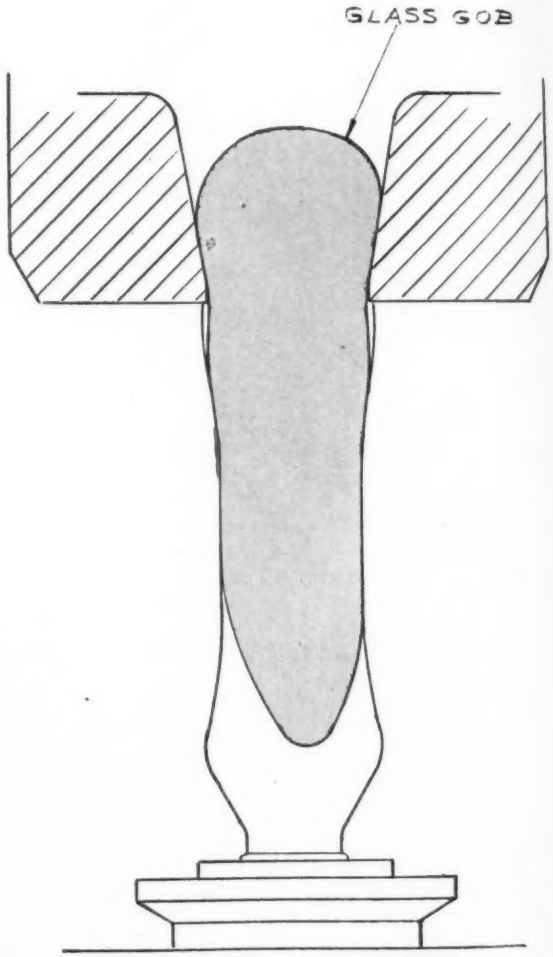


Fig. 10-B. Side cross section blank M-112.

Results and Conclusions

1—The invert post spray was most effective and an overhead spray acceptable.

2—Union Carbide LE-45 was the best silicone blank mold lubricant, with LE-451 next best in this test.

(*Continued on page* 454)

The Platinum Metals in Glass

Coloration and Other Effects of Metals in Solution or Suspension

By M. G. HAWES, A.R.C.S., B.Sc.

PLATINUM METALS have long been used in the glass industry for crucibles and liners because of their high melting points and their chemical inertness to most molten glasses. Contamination of glass by platinum metals has not been reported except in one or two instances where the glasses had a high content of lead or barium. It is well known that heavy lead glasses are more susceptible to colouring by traces of impurity than other types of glass, and Hampton[1] and his co-workers found that glass of this type, even when made from very pure materials, became coloured when heated in platinum. He was able to produce a colourless specimen only by melting in a thoria crucible. Some optical glass manufacturers have also found a reddish colour in glass having a high lead or barium content after contact with a rhodium-platinum crucible; this coloration was probably due to traces of rhodium in the glass.

Another instance of glass becoming coloured by platinum was reported in 1947 when Rindone, Marboe and Weyl[2] were working on the electrolytic oxidation and reduction of glasses containing various metal ions. Platinum electrodes were used and it was found that platinum ions from the anode tended to pass into solution in the glass. In borate glass the platinum ions were unstable and either reverted to metal, which was precipitated in the glass because of the low solubility of platinum, or, under certain conditions of temperature and viscosity, gave pink colloidal platinum producing a glass analogous to the familiar gold-ruby. Phosphate glasses were known to have a stabilizing effect on silver ions in glass solution and they exhibited the same behaviour towards platinum, giving amber-coloured glass, the color being similar to that of a solution of platinic chloride.

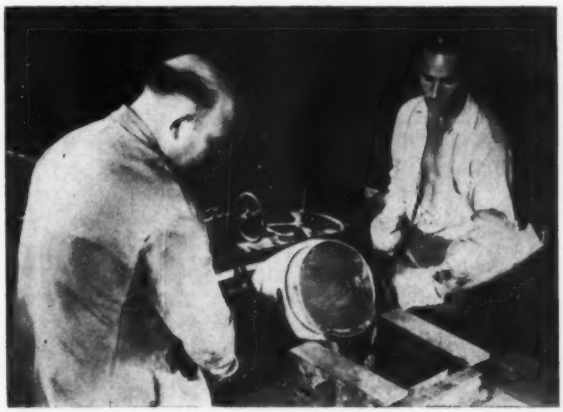
Structure of the Dispersed Metal

During this period work was also being carried out in India on the solution of noble metals in glass. It should be emphasized that in this work the platinum was deliberately introduced in a finely divided state into the glass melt and was not derived from the walls of the container, as it was in the studies of Hampton and of Rindone and his co-workers. The purpose of the investigation was to examine the state of the metal in solution and its effect, if any, on the physical properties of the glass.

Papers were published by Majumda[3] in 1948 on the magnetic susceptibilities of borax glasses containing gold and platinum, and by Majumda and Mukherji[4] in 1953 on the molar refraction of platinum dispersed in Lindemann glass. X-ray studies were made by Majumda and Banerjee[5] in 1946 and by Banerjee[6] in 1953. The former was a short paper dealing with noble metals dispersed in borax and boric oxide glasses, and included X-ray photographs containing lines due to the metal as well as the normal diffuse bands from the glass. Comparison of these lines with X-ray photographs of the pure metal indicated that the metals have the same lattice spacing when dissolved in the glass as they have in the pure state.

This work was extended in the second paper[6] to a more complete study of colloidal coloured glasses containing gold and platinum, borate glasses containing these metals were examined, the samples all being prepared under identical conditions, and it was found that the vitreous limit occurred at a metal concentration of 2 to 3 per cent, depending on the type of glass. The platinum dispersed in the glass gave a grey colour which could be intensified by the addition of an oxide of lead, zinc or antimony—which also served to increase the vitreous limit of the glass, although alkali halides, even in very small amounts, suppressed the development of any colour.

The X-ray powder photographs obtained were similar to those described in the previous paper[5]. As would be expected, the intensity of the lines caused by the platinum increased as the concentration of platinum in the glass increased, but there was a corresponding decrease in the intensity and sharpness of the bands due to the glass. This was thought to result from the superior absorptive power of the dispersoid, such that at concentrations as low as 2 per cent it could override the low absorption of the glass base. The calculation of lattice constant of the dispersed metal confirmed that it was the same as in the massive state.



Pouring molten optical glass from a 12-litre platinum crucible at the Birmingham works of Chance Brothers, Ltd.

Reprinted from *Platinum Metals Review, Vol. 1*, No. 2, April, 1957 courtesy of Johnson, Matthey & Company, Ltd., publishers, London, England.

The Mechanism of Colour Formation

Glasses coloured by colloidal platinum are examples of "ruby glass", a term applied to those coloured red by colloidal gold and copper but now extended to cover glasses containing colloidal platinum and silver, even though the colour is different. An understanding of the mechanism of colour formation in these glasses has been a longstanding problem and Banerjee[7], in a paper published in 1954, approached it by a study of the state of the dispersoid. A colourless glass is usually obtained first, and the colour is developed by heat treatment; it is the nature of the change occurring in this heat treatment that Banerjee attempted to elucidate.

Chemical tests on the colourless specimens showed platinum to be present in the elemental state. The effect of heat treatment is to cause coloration and reference is made to Zsigmondy's theory[8] that this is controlled by the relative rates of two distinct processes. These processes, both of which are temperature dependent, are the formation of colourless, thermodynamically stable nuclei of metal atoms followed by crystallisation of the dispersed phase on these nuclei forming particles large enough to give colour to the glass, which in this instance was grey.

The size of the metal particles in the coloured glasses was determined from the width of the metal lines in X-ray photographs. As the concentration of platinum in the metal increased, the size of the particles increased from about 60 to 243 Å, all in the colloidal range. In transparent coloured glass the metal particles are only partly colloidal, but after prolonged heat treatment the whole of the dispersed phase is precipitated giving an opaque, strongly coloured glass.

Colour in Simple Glasses

Within the last year further studies have been published by a group of workers at the Pennsylvania State University, which provide systematic information on the coloration imparted to glass by the platinum metals. The effect on a wide range of glasses has been studied, since a knowledge of the conditions under which they become coloured by platinum is of great interest in industrial glass manufacture.

The first paper in this group was published by Rindone and Rhoads[9] in 1956 on the colours of platinum, palladium and rhodium in simple alkali borate, phosphate and silicate glasses. The metals were introduced into the glass batches as aequeous solutions of their chlorides to give concentrations varying from 0.0005 to 0.4 per cent.

Palladium causes primarily yellow-brown ionic colours in all the glasses, but at higher concentrations dark grey and brown metallic colours are obtained. Rhodium also occurs mainly in the ionic form giving yellow, peach, orange and amber colours, with metallic greys at higher concentrations. Silicate glasses containing more than 0.05 per cent of rhodium exhibit grey colours due to the presence of rhodium crystals.

Platinum in both silicate and borate glasses gives either transparent or turbid grey colours, shown to be due to dispersed metallic particles, whereas in phosphate glasses yellow, orange and brown colors due to ionic platinum are obtained as well. This behavior is in agreement with previous work[2] which showed that platinum ions were stable only in phosphate glasses.

Anomalous Behaviour in Phosphate Glasses

An apparently anomalous behaviour is observed in some phosphate glasses, namely those with the composition $Na_2O{\cdot}P_2O_5$ and $0.5\ Na_2O{\cdot}0.5\ Li_2O{\cdot}P_2O_5$, as the platinum concentration increases, the colour in the glass changes from grey to yellow, and finally at concentrations above 0.1 per cent the metal crystallises out in the form of hexagonal plates of microscopic dimensions producing beautiful aventurine glasses. In the sodium metaphosphate glasses these effects are accompanied by partial devitrification of the glass when the platinum concentrate lies between 0.002 and 0.008 per cent.

The reason for this change in colour from grey to yellow, which in effect means a change from metallic to ionic platinum in the glass, was investigated by melting in the presence of an oxidising or reducing agent and it was found that on oxidation the grey glasses became yellow, while by reduction the yellow glasses could be made grey. Since the platinum was introduced into the glass as chloride, the melt becomes more oxidising as the concentration of platinum increases, through the following reactions which produce a chlorine atmosphere:

$$PtCl_4 \xrightarrow{370^\circ} PtCl_2 + Cl_2 \quad \text{(i)}$$

$$PtCl_2 \xrightarrow{581^\circ} Pt + Cl_2 \quad \text{(ii)}$$

At low platinum concentrations (ii) proceeds to completion giving metallic platinum in the glass, but at higher concentrations the chlorine partial pressure of (i) is greater than that of (ii), so reaction (ii) is suppressed leaving platinum in the ionic form.

The explanation of the colour change by this mechanism is supported by the fact that grey platinum glass turns yellow in a chlorine atmosphere.

This question of the mechanism of colour formation has been further studied in a paper presented by Ryder and Rindone[10] to the October 1956 meeting of the Glass Division of the American Ceramic Society. The effect of platinum in simple lead glasses was studied and although the paper is still in the press an abstract indicates that predominantly grey colours were obtained with borate glasses and yellow-red with phosphate glasses. Attempts were made to explain the formation of these colours on the basis of chloro-platinic reactions in the glass melt which are susceptible to oxidising and reducing agents.

The singular behaviour observed with platinum in sodium metaphosphate glass[9] is the subject of further study in a paper by Rindone and Ryder[11]. The platinum was introduced into the glass melt as chloride giving concentrations of 0.002 to 0.006 per cent. In this instance grey colorations were obtained, while the platinum also caused the glass to devitrify when present in concentrations of 0.002 per cent and over. Electron micrographs indicated that the presence of platinum nuclei in the melt causes the molten glass to separate into two phases, thus enhancing its devitrification. X-ray diffraction analysis showed that the phase crystallising from the glass in the presence of platinum was different from that obtained by devitrification without platinum, and moreover could not be identified using any known dif-

(*Continued on page* 455)

Recent Translations of Russian Papers of Interest to the Glass Industry

Crystallization of Some Experimental Glasses

M. V. Okhotin, R. S. Levina and E. K. Vinogradova report, in *Steklo i Keramika* (*Glass and Ceramics*) *11*, No. 6, p. 8 (1954), the results of their microscope study of devitrification of 48 experimental silicate glasses.

The glasses were prepared in platinum crucibles with the exemption of those containing 5% MgO, which were made in porcelaine crucibles. All glasses were then ground to a fine powder, the powder freed from ferromagnetic impurities with a magnet and melted again in a platinum crucible. Fragments, about 0.2 g. in weight, of these glasses were checked for uniformity (with a microscope) and then placed in platinum trays. Twelve such trays were heated together in an electric oven. Then:

(a) From time to time, the trays were taken out and the length of the largest crystals in them was measured in a microscope. If l was this length and t was the time the fragment spent in the oven, then the linear rate of crystallization was l/t. This rate naturally depended on the temperature of the oven. Fig. 1 shows this rate for three glasses and five temperatures. The greatest rate of crystallization and the corresponding temperature are listed in Table I for 17 representative glasses.

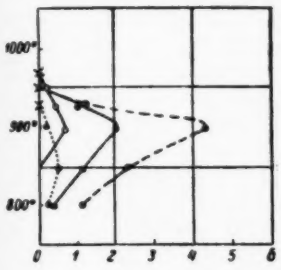


Fig. 1

(b) The optical constants of the visible crystals were determined and thus the nature of the crystals ascertained. Table I shows whether the rate of crystallization was determined for devitrite, wollastonite, or crystobalite.

(c) After devitrification at a high temperature, the fragments had the shape of a thin plate, about 1mm. thick. Then they were again placed in a platinum cylinder in the oven, kept in it at a constant (high) temperature for six hours, and the cylinder was plunged in glycerol. If in the plates then no crystals could be detected, the oven temperature was above the upper crystallization limit. This limit could be determined within—3° C. This limit also is listed in Table I.

C in the table means crystobalite, D devitrite (Na_2O, 3 CaO, 6 SiO_2), and W wollastonite ($CaSiO_3$). It is seen that devitrite was the most common mineral; it formed either bundles of thin plates or fibrous mats. Wollastonite was present as flat long prisms. In addition to these minerals, also pseudo-wollastonite ($CaSiO_3$), diopside (CaO, MgO, $2SiO_2$), and the silicates 2 Na_2O, CaO, 3 SiO_2 and Na_2O, CaO, SiO_2 were observed.

In Fig. 2, the abscissa represents the rate of crystallization (in 10^{-4} cm. per second) while temperature (in °C) is plotted along the ordinate. The dotted curve refers to glass SiO_2 72, Na_2O 16, Al_2O_3 3, CaO 6, MgO 3 per cent; the two continuous curves refer to glass SiO_2 70, Na_2O 16, Al_2O_3 5, CaO 8, MgO 1 per cent (the left hand curve is

Table 1

Glass composition: 16 wt.% Na_2O plus SiO_2	Al_2O_3	CaO	MgO	Upper crystn. limit °C	Maximum rate of crystn. microns/min	Temp. (°C) of most rapid crystallization
75	3	6	0	969	0.13 C	850 C
73	5	6	0	938	0.43 D	850 D
74	3	6	1	953	0.42 D	850 D
72	5	6	1	968	0.48 D	850 D
74	1	6	3	944	0.52 D	850 D
72	3	6	3	967	0.45 D	850 D
70	5	6	3	983	0.45 D	850 D
73	0	6	5	988	0.67 D, 0.23 W	800 D, 850 W
72	1	6	5	999	0.6 D, 0.48 W	850 D, 900 W
73	3	8	0	983	1.28 D	900 D
71	5	8	0	998	1.81 D	900 D
74	1	8	1	995	1.98 D, 0.34 C	875 D, 800 C
72	3	8	1	988	1.4 D	900 D
70	5	8	1	993	2.0 D, 0.76 W	900 D, 900 W
73	0	8	3	983	4.29 D	900 D
72	1	8	3	995	3.24 D, 2.83 W	900 D, 900 W
70	3	8	3	998	2.56 D, 2.22 W	900 D, 900 W

for wollastonite, and the right hand curve for divitrite); and the dash curve is valid for glass SiO_2 73, Na_2O 16, CaO 8, MgO 3 per cent.

Continuous Production of Sodium Silicate

Solid sodium silicate, an intermediate in the manufacture of water glass, is produced as "ingots" in the plant "The Proletary" as reported by M. D. Tamarin in *Steklo i Keramika* (*Glass and Ceramics*) 11, No. 1, p. 17 (1954).

The melting is carried out in a usual glass furnace of 78 sq. meter area, at 1380-1400°C. The production is 1.4 to 2.0 metric tons from one square meter for 24 hours.

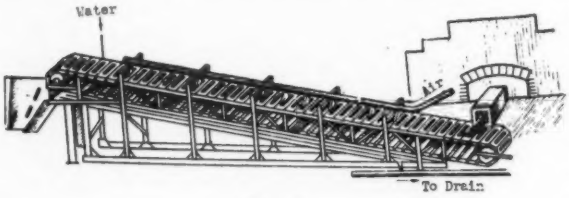


Fig. 2

The molten glass is allowed to run out through a square brick channel shown at the right of Fig. 2. It fills, one after another, the flat trays tightly arranged on a conveyer belt (which occupies the main area of Fig. 1). The conveyer is 12.5 meters long, its left hand end is 2.5 meters higher than the right hand end; it moves at a speed of 0.4-1.2 meter per minute, and can transport up to 150 metric tons of glass in 24 hours. The direction of the movement is up and to the left for the upper half, and down and to the right for the lower half of the conveyer belt. Between the upper and the lower halves, water pipes are arranged. These have holes along their upper wall. Water fountains rising from these holes cool the bottom of the filled trays; then water falls on the returning empty trays and again cools them; finally it is led to drain.

The trays are so cool when they reach the highest point of the conveyer that the sodium silicate "ingots" fall out of them when the belt assumes vertical position. Then they slide into trolleys and are transported to the shipping department.

Silvering of Glass

A. K. Dorokhov, Z. A. Mitskevich and O. A. Brilliant disclose in *Steklo i Keramika* (Glass and Ceramics) *11*, No. 11, p. 25 (1954), that the utilization of silver during silvering is improved by addition of traces of iodine to the silvering solution.

The recommended solutions are:

For heat-insulating flasks

1. silver nitrate 2 g., sodium hydroxide 2 g., 25 per cent ammonia 7.5-10 ml., 5 per cent solution of iodine in alcohol 0.048 ml., water to 1 liter

2. 10 per cent solution of inverted sucrose. One part of this solution is used for 150 parts of the preceding liquid.

Temperature 35-40°C. Time 2 to 3 minutes.

For mirrors (double treatment)

1. silver nitrate 4 g., sodium hydroxide 4 g., 25 per cent ammonia 15-17.5 ml., 5 per cent solution of iodine in alcohol 0.048-0.084 ml., water to 1 liter

2. 10 per cent solution of inverted sucrose. One part is used for 100 parts of the preceding liquid.

Temperature 25-27°C. Duration 8 to 10 minutes.

The utilization of silver was 88-95 per cent. In the absence of iodine the utilization was less than 50 per cent.

Acceleration of Glass Grinding

This acceleration was achieved by A. V. Troitskii *Steklo i Keramika* (Glass and Ceramics) *11*, No. 12, p. 5 (1954) in two different ways.

1. The usual natural sand used for grinding has rounded edges and corners. Such a sand was compared with another, of an identical particle size and identical provenience, but with sharp outlines; the latter was obtained by crushing large (roundish) sand grains. Table I shows the effect of the grain shape on the amount of glass removed under identical conditions, on the force required to maintain the grinding at a constant speed, and on the force referred to unit mass removed. Thus, for instance (see the last line of the table) sharp grains removed 1.49 times as much glass as did rounded grains and the force required for this operation was 1.17 times as great, while 0.78 is 1.17/1.49.

Table I

Sand fraction	Ratio of amounts	Ratio of forces	Ratio of force: amount
500-250 microns	1.49	1.60	1.07
250-200	1.55	1.39	0.91
200-150	1.70	1.43	0.84
150-120	1.68	1.32	0.79
120- 88	1.49	1.17	0.78

2. Troitskii suspected that the above intensification of grinding was due to the fact that the sharp grains became embedded in the grinding disk, thus lost their ability of rolling between the disk and the glass, and spent more time cutting the glass than did the grains which were not embedded and hence were free to rotate.

In accord with this hypothesis, a disk made of porous iron with 40-50 per cent porosity gave rise to a more efficient grinding than a usual cast iron disk. The abrasive grains stuck in the pores, did not roll, and thus were able to cut. The material of the disk was Fe 99.25 per cent, Mn 0.36 per cent, C 0.07 per cent; and its Brinell hardness was 10.45 to 13.3 kg./sq.mm.

Corrosion of Refractory Pots By Lead Glass

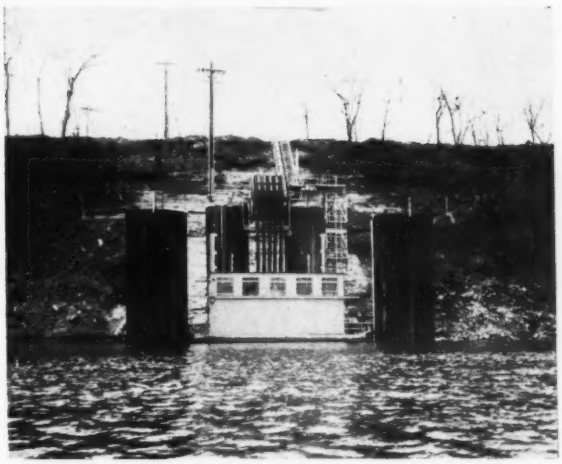
N. A. Shmeleva describes, in *Steklo i Keramika* (Glass and Ceramics) *11*, No. 9, p. 23 (1954), the effect of the glass composition on this corrosion.

Two types of pot were used. Type A had a capacity of 200 liters and was made of chamotte in which the ratio of clay to kaolin was 1:4. Type B had the capacity of either 3 or 16 liters and the ratio of clay to kaolin in it was 2:3. After usage, the former type had specific gravity between 2.41 and 2.46, while the specific gravity of type B was 2.10 to 2.32.

When a lead glass, such as SiO_2 57.5, Na_2O 4.5, K_2O

(*Continued on page* 456)

Floating Pump House for Ford's New Glass Plant

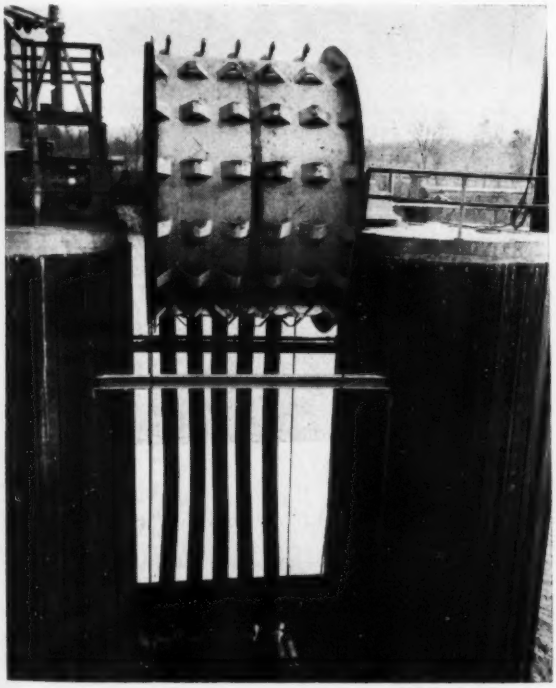


Floating pump house for Ford Motor Company's new glass plant near Nashville, Tenn. was designed to cope with extreme rise and fall of the Cumberland River. Facility was built by Dravo Corporation, Pittsburgh, Pa.

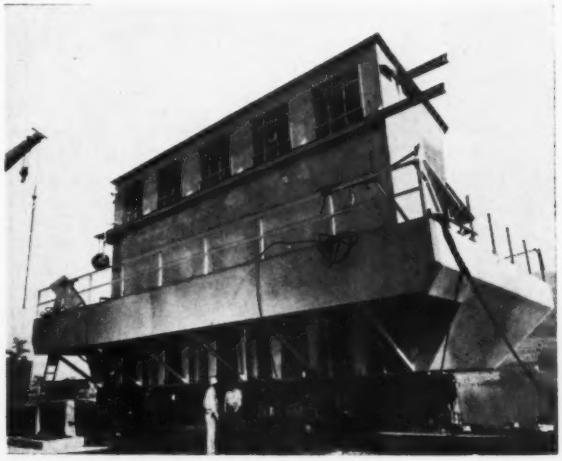
• AN UNUSUAL FLOATING pump house is feeding 14 million gallons of process water a day to the Ford Motor Company's new glass plant near Nashville, Tenn., from the Cumberland River.

Ford engineers enlisted the aid of Dravo Corporation, Pittsburgh, in building this facility. They preferred a floating pump house to the conventional fixed structure usually employed.

With the Dravo-built pump house, intakes are maintained at a constant immersion depth, regardless of the river level.



Hose for the floating pump house is attached to 16-foot diameter steel reel. Water flows from hoses through elbows into 24-inch axle of the reel, which serves as manifold for the discharge of all hoses. Note steel cables wrapped around flanges of the reel and controlling its rotation. Hoses are always held taut as the barge rises or falls with the river level.



The floating pump house is shown before launching at Neville Island (Pittsburgh) shipyards of Dravo Corporation. Note outrigger construction of barge to offset change in loading which occurs when river rises and hoses shift from barge to reel.

Pumps and intake screens are mounted on a specially-designed welded steel barge, moored to four steel sheet pile cells. The 50-foot by 30-foot barge is fitted with pneumatic-tired wheels at each of its four corners. The wheels run in I-beam tracks welded to the sides of the four cells, which rise 60 feet above the normal water level.

In addition to serving as guides for the vessel's up and down motion, the cells, which are filled with sand and gravel and capped with concrete, help fend off floating logs and debris. The two riverward cells are 16 feet in diameter, the two landward cells are 13 feet 7 inches in diameter.

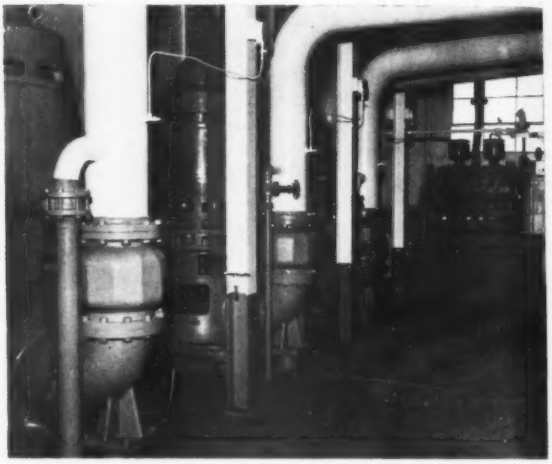
Mounted atop the landward cells is a 16-foot diameter steel hose reel, grooved to receive five 12-inch diameter rubber hoses. Each hose is attached to an elbow into the hollow 24-inch axle of the reel, so that the axle serves

Motion of the pump house hull is guided by pneumatic-tired wheels at the four corners of the barge, running on I-beam tracks welded to the sides of the four steel sheet pile cells.

Each of five pumps of the floating pump house has an individual suction chamber, protected with a screen opening eight feet below water line. Here a Dravo workman examines exterior of suction chamber before barge is launched.

as a manifold for the discharge of all the hoses. To one end of the axle is connected a 24-inch diameter pipe which leads along a steel grid walkway to the shore and up the bank to a water treatment plant, built by Dravo's Machinery Division. The hoses extend some 40 feet to discharge outlets on the five pumps.

Controlling rotation of the hose reel are 1⅝-inch diameter steel cables wrapped around the flanges of the reel and leading directly down to the barge on the riverward side and through a fixed sheave between the cells up to the barge on the shore side. Thus, when the river rises, lifting the pump barge, the cables are pulled down, automatically reeling in the hoses. When the river falls, the hoses are paid out. In this way, the hoses always are properly spaced between barge and reel.



This interior view of the floating pump house shows three of the four electrically driven 4000-gallon-per-minute pumps. In the background is a 2500-gallon-per-minute diesel driven pump, which serves as a standby.

Each of the five pumps on the barge has an individual suction chamber protected with a screen opening. The opening is eight feet below water. Each of four of the pumps, which are contained in a deckhouse on the barge, has a capacity of 4000 gallons per minute and are electrically-driven. The fifth, a 2500-gallon-per-minute unit driven by a diesel motor, is used as a standby in the event of electric power failure.

The four cells were constructed by Dravo's contracting division. The company's engineering works division built the barge and hose reel at Dravo's Neville Island shipyard near Pittsburgh.

CURRY, KOPP TREASURER, RETIRES

Grant Curry, one of the founders of Kopp Glass, Inc., has retired as treasurer. He will continue as a director of the Swissvale, Pa. producer of signal, industrial and technical glass. Mr. Curry has been with the company since he helped establish it in 1926, except for wartime service as a lieutenant colonel in the U.S. Army.

G. D. Hammond has been elected treasurer and secretary of Kopp Glass. He started with the company in 1926 and most recently has been secretary and assistant treasurer.

Inventions and Inventors

Furnaces

Glass Blending. Fig. 1. Patent No. 2,762,167. Filed March 23, 1953. Issued Sept. 11, 1956. One sheet of drawings; one reproduced. Assigned to Corning Glass Works, by Charles F. De Voe.

The present invention relates to the conditioning of glass for the production of relatively large or massive glass objects which are not only substantially cord-free but whose individual index of refraction varies throughout within a very narrow range and is particularly directed to the production of such high-quality glass objects on a continuous basis.

By careful control of the batch composition together with maintenance of the melting conditions substantially constant, longitudinal variation of the refractive index can be held within a relatively narrow tolerance and, in some instances, has been held so that it is no greater than $\pm 2 \times 10^{-4}$.

In operation, (see Fig. 1), the molten glass continuously flowing into chamber 11 through channel 20 is continuously blended with the body of molten glass already contained in chamber 11 by repeated circulation.

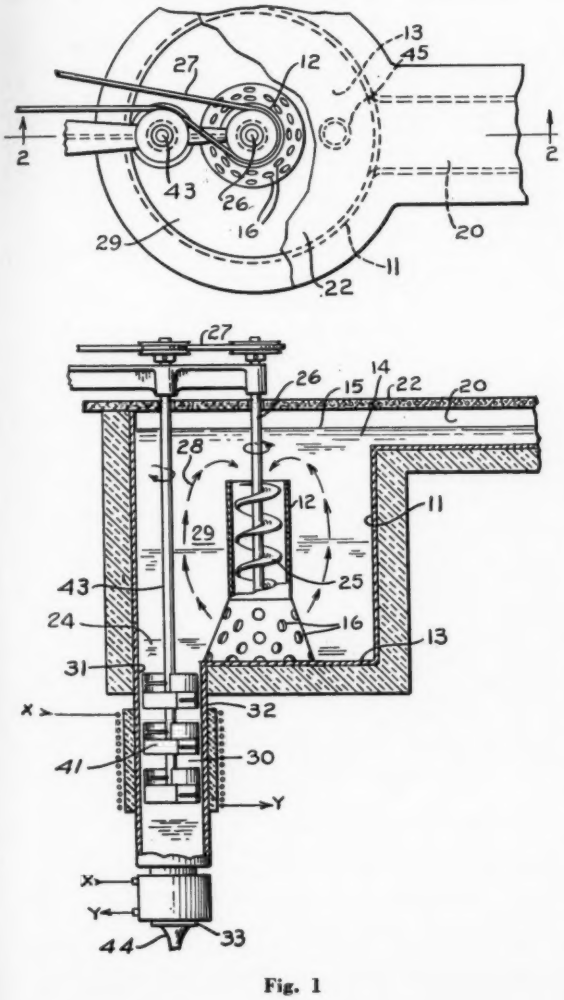


Fig. 1

As the glass within chamber 11 is being circulated therein. a portion of such blended glass is continuously being fed through outlet 31 into stirring housing 32 wherein the stirring elements of stirrer 41 subject the same to a repeated primarily horizontal shearing action which serves to attenuate and thereby eliminate any cords or striae present in such glass. Although the circulation within chamber 11 serves to effectively reduce the longitudinal variation in the refractive index of the glass introduced into stirring housing 32, no significant shearing action can be simultaneously exerted on the circulating glass because of the large volume of the body of glass contained in chamber 11 and the relatively high speed at which it is desirable to circulate the same. Accordingly, any cords present in the stream of glass fed to chamber 11 are still substantially present in the stream of glass withdrawn therefrom through outlet 31.

There were two claims and the following references cited in this patent: 2,467,809, Cannon et al., Apr. 19, 1949; 2,569,459, De Voe, Oct. 2, 1951; and 711,976, France, July 8, 1931.

Stirring Glass. Fig. 2. Patent No. 2,750,161. Filed August 5, 1952. Issued June 12, 1956. One page drawings. Assigned to Pittsburgh Plate Glass Company by Ralph W. Simmons.

This invention pertains specifically to a method for removing inhomogeneities by stirring the glass within a relatively small confined space through which the glass is being continuously passed.

Referring to the drawings: in Fig. 2, 1 indicates a substantially elliptical container having arcuate end walls connected by substantially flat side walls. An aperture 2 in one of the side walls adjacent to the top of the container provides an inlet and an aperture 3 in a bottom wall 4 of the container 1 provides an outlet for passages of the glass through the container. Mounted within the container 1 are spaced stirring rods 6 which are preferably of similar construction and which pass through a suitable opening in the top wall 5.

It is preferred to make the container 1, stem 6, and blades 7 and 8 of platinum and, in order to reduce the cost thereof, it is also preferred to make the stems 6 of an interior ceramic core having a sheath of platinum 6a enclosing the core.

In the operation of the device, molten glass is admitted into the container 1 through inlet 2 and passes out of the container through outlet 3. The relative rates of flow at the inlet and outlet are regulated so that the container during operation is maintained substantially full of molten glass at least to adjacent the height of the inlet 2 and in all cases to a height above blades 7 sufficient to avoid introduction of air into the glass during the stirring operation. The blades 7 and rods 6 may be rotated in either direction. By reason of the

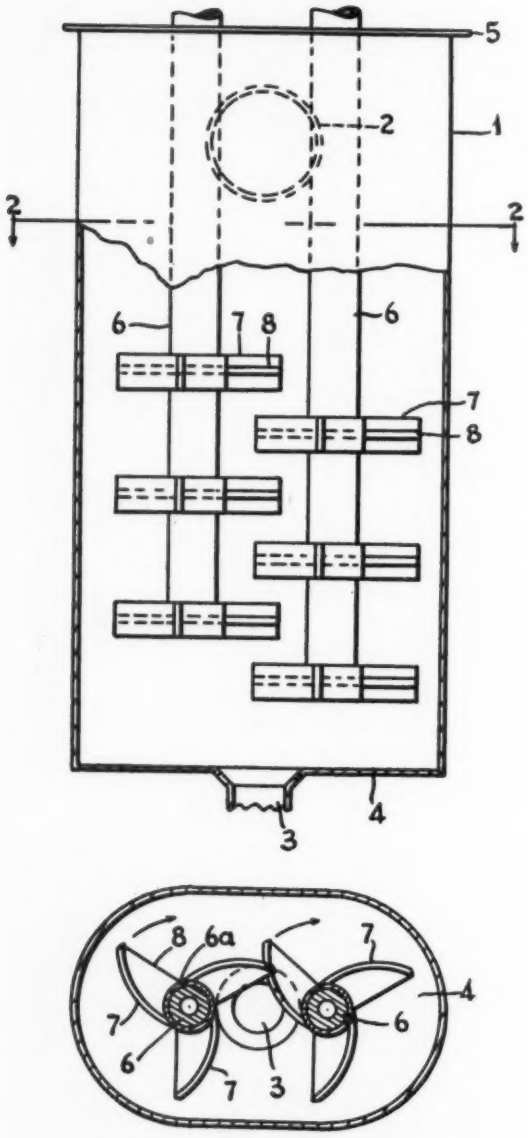


Fig. 2

glass continuously flowing through the container, a circular motion is maintained but instead of continuing in a common plane follows a generally spiral path.

In the zone of turbulence, successive portions of displaced glass are subjected to random motions created by the reverse motions of the overlapping blades in this region. The molten glass within this turbulent zone is sheared and attenuated by the reverse vertical motions set up therewith in the central portion of the chamber, thereby providing efficient mixing through both attenuation and shear of any homogeneities present.

There were 2 claims and the following references were cited in this patent: 976,363, Hinkhouse, Nov. 22, 1910; 1,498,286, Marsh, June 17, 1924; 2,569,459, De Voe, Oct. 2, 1951; 2,570,079, Spremulli, Oct. 2, 1951; 371,190, Great Britain, Apr. 21, 1932; and 41,254, France, Aug. 30, 1932.

Glass Compositions

Attenuating Glass and Other Fibers. Fig. 3. Patent No. 2,729,029. Filed June 8, 1954. Issued Jan 3, 1956. Two sheets drawings. Assigned Owens-Corning Fiberglas Corp., by Games Slayter.

The present invention has particular applicability in producing fibers in strand or linear group formation usable in the textile industry. It is highly desirable that the strands or yarns be formed of continuous fibers especially where a high tensile strength or uniformity of strand size is desired.

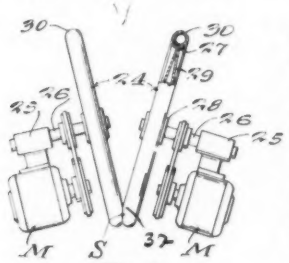


Fig. 3

One form of fiber attenuating means is shown in Fig. 3. The attenuating instrumentalities or rolls 24 are of wheel-like configuration and are respectively mounted upon shafts 26 arranged in angular relation and supported in bearings 25, the included angle of the axes thereof being approximately one hundred sixty degrees, although other degrees of angular relationship may be used if desired. The shafts 26 may be driven by motor M arranged for synchronous operation or by a single motor.

The instrumentalities or rolls 24 may be formed with a rim 27 joined to a hub 28 by means of wire spokes 29 or a lightweight disc-like body. The rim 27 carries an annularly shaped endless casing or tube 30 of rubber of pneumatic tire-like character which may, if desired, be inflated through suitable conventional valve means (not shown). By varying the pressure within the tube 30 and the extent of interengagement of the wheels 24, the effectiveness of the gripping force upon the strand S may be modified to attain satisfactory operation.

The instrumentalities 24 are arranged so that lateral surfaces or regions of the tubes 30 are in engagement of a nature whereby the contacting lateral portions of the tube walls are distorted into flat areas forming a fiber gripping zone of generally oval configuration as indicated at 32.

The instrumentalities of this character for attenuating a strand of fibers, being arranged for rotation about axes disposed in angular relationship, substantially eliminate the tendency of individual or straggling fibers insecurely held in the strand to cling to and become wound upon the instrumentalities.

There were 21 claims and the following references cited in this patent: 2,448,499, Swann, Aug. 31, 1948; and 2,489,243, Stalego, Nov. 22, 1949.

Flint Glasses For Multifocal Lenses. Patent No. 2,762,713. Filed December 3, 1953. Issued Sept. 11, 1956. No sheets of drawings. Assigned to Bausch & Lomb Optical Company, by Earl K. Davis, et. al.

The invention relates to optical glass compositions and more particularly it has reference to compositions of flint glasses which are adapted to be used as one of the elements in fused multifocal lens manufacture.

Glass embodying the invention comprise, by weight,

(*Continued on page* 462)

The Crystalline Phase in Fluoride Opal Glasses

• A PREVIOUS INVESTIGATION provided information on the different types of fluorides which could be precipitated when the calcium oxide in a fluorine-containing soda-lime-silica glass was completely replaced by various other divalent oxides. The results obtained showed that the precipitated fluoride was not always that of the cation introduced. It was therefore suggested that the work should be extended to cover the various combinations obtainable by using more than one divalent oxide at a time, and to determine the composition in any series at which a new crystalline phase (if any) appeared.

Such information would give the relative facility of precipitation of the various cations as fluorides, and on this basis it has been possible to provide some explanation of fluoride precipitation in the light of present-day views of glass structure. The results of such an investigation are described by G. Rothwell in the December 1956 issue of the *Journal of the American Ceramic Society*.

Batches were melted in calcined kaolin pots, as these were found to be fairly resistant to corrosion by the compositions involved. The pots were heated in a gas-fired furnace for a total time of 4 hours from the introduction of the raw materials and at a maximum temperature of 1450°C. The resulting glasses were cast onto a steel plate, rolled as thick sheets, and roughly annealed.

The melts were derived from the following base composition:

	SiO_2	72 per cent
	Na_2O	15 "
	CaO	12 "
	Al_2O_3	1 "
Added:	F_2	10 "

The compositions for investigation were derived by substituting the divalent oxides MgO, SrO, BaO, and ZnO one at a time for the calcium oxide in the base glass, in steps of 3 per cent by weight. The oxides SrO, BaO, and ZnO were next substituted in the same way for magnesium oxide, and so on, for all combinations of these oxides. The divalent oxides MgO, SrO, BaO, and ZnO were then substituted two at a time for the calcium oxide, again in steps of 3 per cent by weight, as illustrated in the following example:

(1)	(2)	(3)
CaO 6 per cent	CaO 3 per cent	CaO 3 per cent
MgO 3 "	MgO 6 "	MgO 3 "
SrO 3 "	SrO 3 "	SrO 6 "

The other glasses to be considered in such a series are of course included in the single substitutions, e.g.,

CaO 9 per cent	CaO 9 per cent
MgO 3 "	MgO Nil
SrO Nil	SrO 3 per cent

These substitutions were again carried out for all the possible combinations of the foregoing oxides in this manner.

From the results of this work it was concluded that the facility of precipitations of the various fluorides in the opal glasses investigated appears to be closely related, in an inverse manner, to the glassforming ability of the corresponding cations. Those ions which are more capable of taking part in the glass network are less readily precipitated as fluoride in the crystalline phase, other conditions being equal.

Applying the criteria suggested by Stanworth, Zn^{++} with its 18 outer electrons is able to form bonds with a marked covalent character, and since an oxygen coordination of four is possible, it may enter the network to some extent. These considerations explain the tendency of the zinc to be exclusively present in the glassy phase of the opal glasses. Of the other ions with large numbers of outer electrons, Pb^{++} with (18+2) and Cd^{++} with an 18-electron shell were introduced into fluoride opal glasses by Callow and were not precipitated as fluoride.

The behavior of the Mg^{++} ion in fluoride opal glasses can be explained in a similar manner. Although having only 8 outer electrons, it has, together with the Be^{++} ion, a higher electronegativity than the other ions in this class and is of such a size that it may assume fourfold coordination with oxygen, the bonds having a certain degree of covalency. The Mg^{++} ions may therefore be considered to take part in the glass network to a greater extent than do the ions with an outer shell of 8 electrons. These deductions agree very well with the behaviour of the Mg^{++} ion in fluoride opal glasses, for it has been shown that magnesium fluoride as such is not precipitated at all. The formation of a double salt with readily precipitated sodium fluoride is necessary before Mg^{++} appears in the crystalline phase. This statement is not meant to imply that the formation of a compound with a readily precipitated salt necessarily makes the magnesium fluoride more easily separated, but in this case (formation of $NaF\text{-}MgF_2$) the experimental results show that the double salt is in fact a constituent of the crystalline phase in some cases. The displacement of Mg^{++} ions as $NaF\text{-}MgF_2$ by Zn^{++} ions, which occurs in MgO-ZnO opal glasses, would have been expected on the grounds stated above, even if the precipitation has been as free magnesium fluoride, and will of course take place to an even more marked degree with the double salt. The increased facility of precipitation of $NaF\text{-}MgF_2$ over magnesium fluoride is further demonstrated by the fact that the double salt crystallizes even a little more readily than does Ba^{++}, which has been regarded as a network-modifying ion. Although Be^{++} was not used in the present investigation, it was stated by Callow that a fluoride glass with 12 per cent BeO by weight gave no diffraction pattern (i.e. a clear glass) and it is also known that beryllium fluoride can itself form a glass.

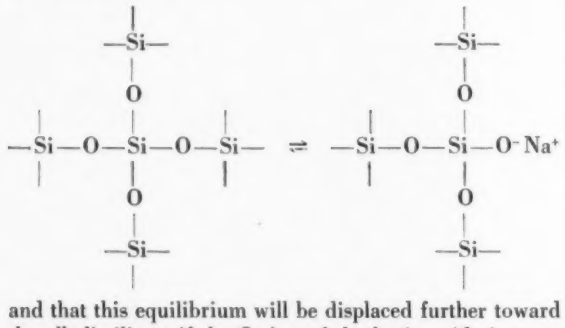
All the other ions (Na^+, Ca^{++}, Sr^{++}, Ba^{++}) were identified as fluoride in the crystalline phase of the respective opal glasses. In a very general way this fact agrees with the view that these ions do not take part in the glass network but exist as modifying ions which would be readily available for fluoride formation. There are, however,

differences in the facility of precipitation of these ions; the Ba^{++} ion, which one would expect to be readily precipitated in the same way as the other ions, is in fact probably less readily precipitated even than $NaF\text{-}MgF_2$.

In order to assess the glassforming ability of the various elements, Sun made use of the calculated single bond strength between the cation M and a neighboring oxygen. If the ions investigated are placed in the order of M—O bond strength, Ba^{++} is higher than Na^+, Ca^{++}, and Sr^{++}.

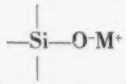
This method of differentiation is not, however, entirely satisfactory. The value of E^1_M/C given for Ba^{++} is only a very little greater than that for Sr^{++}, but more important still is the fact that from this point of view K^+ should be even more readily precipitated than Na^+. In the fluoride opal glasses containing potassium oxide, prepared by Callow, potassium fluoride was never found alone and so the foregoing criterion certainly does not give a satisfactory explanation of the facts.

It is felt that the shortcoming of the foregoing treatment lies in the fact that too restricted a view is taken of the glass structure. A broader and more satisfactory view has been taken by Weyl, who applied to glasses the theory of K. Fajans on the deformation of an anion in the cation field. Weyl shows that polarization phenomena are not restricted to ions with a non-noble-gas type of structure but are equally important when ions with 8 outer electrons are considered. He points out that the oxygen ions in silica have a low polarizability since their electron cloud is contracted by the strong positive fields of two Si^{4+} ions in close proximity. In contact with a basic oxide (e.g. Na_2O) the silicon ions will tend to attract the more polarizable O^{--} ions of the Na_2O in order to give better screening to their own potential fields. He postulates that this will lead, at any particular temperature, to an equilibrium of the type



and that this equilibrium will be displaced further toward the alkali silicate if the O^{--} ion of the basic oxide is more polarizable. The polarizability of this oxygen ion depends on the polarizing power of the cation; e.g., the O^{--} ion in Li_2O is less polarizable than the O^{--} ion in Na_2O.

Applying these coordination principles to the fluoride formation in opal glasses, it can be assumed that the position of the foregoing equilibrium for the various oxides is a measure of the stability of the grouping



and the more desirable this grouping is from the standpoint of of Si^4 screening, the less will be the probability of the cation being precipitated as fluoride. Now the ionic radii of the ions in question are as follows:

Na^+	0.95×10^{-8} cm.
Ca^{++}	0.99×10^{-8} cm.
Sr^{++}	1.13×10^{-8} cm.
K^+	1.35×10^{-8} cm.
Ba^{++}	1.35×10^{-8} cm.

and it will be seen that on this basis the ions become arranged almost in the order of their ease of precipitation as fluorides. The ions Na^+, Ca^{++}, and Sr^{++} are all freely precipitated in fluoride opal glasses. They are fairly small ions and Sr^{++}, the largest of the three, has a charge of +2 which will decrease the polarizability of its attached oxygen ions. Similarly, Ca^{++} has a greater polarizing power than Na^+, due to its double charge. It can be considered to be more readily precipitated than Na^+ since it was always precipitated as fluoride even though, in all the glasses, it was present in much smaller amounts than the sodium ion. The two remaining ions K^+ and Ba^{++} are larger ions with, consequently, a more easily polarized attached oxygen ion. They are therefore less likely to be precipitated as fluoride. They are of comparable size, and so potassium, with its single positive charge, can be expected to polarize an attached O^{--} ion to a lesser extent than a Ba^{++} ion. It would therefore be expected that barium fluoride would be precipitated rather than potassium fluoride in $K_2O\text{-}BaO$ opal glasses, and this was found to be the case by Callow.

These ideas on the relation between the polarizing power of a cation and the facility of its precipitation in fluoride opal glasses do not affect the previous statements concerning the behavior of Zn^{++} and Mg^{++} ions. These ions, as already stated, are of such a size as to assume a coordination number of four with oxygen, thus entering the network to some extent, and Zn at least, with its outer shell of 18 electrons, needs special consideration.

Further data, particularly of a quantitative nature, will be necessary before an accurate picture can be built up of the chemical and physical processes which occur in the precipitation of fluorides in opal glasses. These should account for the great changes in opacity which are observed with changes in the nature of the divalent oxides present.

T. J. BUTCHKO IS PLANT MANAGER

Thomas J. Butchko has been appointed plant manager of Glass Products, Inc., in Ellwood City, Pa., a subsidiary of American Window Glass Company, it was announced by H. Dean Menoher, vice president of manufacturing.

Replacing Mr. Butchko who was formerly production superintendent of AWG's factory number 1 in Arnold, Pa., is William H. Beazell who held the post of assistant to chief chemist.

Mr. Butchko graduated from Pennsylvania State University in 1942, majoring in ceramics. Following a period of over four years in the armed services, he joined the American Window Glass Company as assistant chemist.

• Michael Giglio and Richard Freitas, graduates of St. John Fisher College, and Henry Walter, graduate of the University of Pittsburgh, have joined Bausch & Lomb Optical Company's chemical research laboratories as inorganic chemist and glass technologists, respectively, according to N. J. Kreidl, chemical research director.

Current Statistical Position of Glass

Employment and payrolls: Employment in the glass industry during May, 1957 was as follows: *Flat Glass*: A preliminary figure of 27,200 for May, 1957 indicates a decrease of 3.8 per cent from the adjusted 28,300 reported for April, 1957. *Glass and Glassware, Pressed and Blown*: An increase of 1.2 per cent is shown by the preliminary figure of 81,500 for May, 1957, when compared with the adjusted figure of 80,500 for April, 1957. *Glass Products Made of Purchased Glass*: The preliminary figure of 13,800 for May, 1957, indicates a decrease of 1.5 per cent from the previous month's adjusted figure of 14,000.

Payrolls in the glass industry during May, 1957 were as follows: *Flat Glass*: A decrease of 3.9 per cent is shown in the preliminary $13,062,157.81 when compared with April, 1957's adjusted $13,586,728.12. *Glass and Glassware, Pressed and Blown*: An increase of 2.2 per cent is shown in the preliminary $29,674,312.19 reported for May, 1957 when compared with the previous month's adjusted $29,036,989.07 figure. *Glass Products Made of Purchased Glass*: A preliminary figure of $4,039,179.27 was reported for May, 1957. This is a decrease of 4.4 per cent when compared with the adjusted figure of $4,225,108.30 for the previous month.

GLASS CONTAINER SHIPMENTS

(All Figures in Gross)

	June, 1957
Narrow Neck Containers	
Food	1,238,000
Medicinal and Health Supplies	1,256,000
Chemical, Household and Industrial	710,000
Toiletries and Cosmetics	663,000
Beverage, Returnable	1,257,000
Beverage, Non-returnable	128,000
Beer, Returnable	417,000
Beer, Non-returnable	916,000
Liquor	818,000
Wine	339,000
Sub-total (Narrow)	7,760,000
Wide Mouth Containers	
Food	*3,358,000
Medicinal and Health Supplies	352,000
Chemical, Household and Industrial	170,000
Toiletries and Cosmetics	199,000
Packer's Tumblers	67,000
Dairy Products	175,000
Sub-total (Wide)	4,321,000
Total Domestic	12,081,000
Export Shipments	228,000
TOTAL SHIPMENTS	12,309,000

*This figure includes Fruit Jars and Jelly Glasses.

GLASS CONTAINER PRODUCTION AND INVENTORY

(All Figures in Gross)

		Production June, 1957	Stocks June, 1957
Food, Medicinal and Health Supplies; Chemical, Household and Industrial; Toiletries and Cosmetics	Narrow Neck	4,660,000	6,933,000
	Wide Mouth	*4,079,000	*5,477,000
Beverage, Returnable		1,200,000	1,682,000
Beverage, Non-returnable		168,000	253,000
Beer, Returnable		363,000	490,000
Beer, Non-returnable		891,000	704,000
Liquor		802,000	1,253,000
Wine		345,000	666,000
Packers' Tumblers		72,000	111,000
Dairy Products		167,000	291,000
TOTAL		*12,747,000	*17,860,000

*This figure includes Fruit Jars and Jelly Glasses.

Glass container production: Production based on figures released by the Bureau of Census was 12,747,000 gross during June, 1957. This represents an increase of 2.0 per cent from the previous month's production of 12,505,000 gross. During June, 1956, glass container production was 12,567,000 gross or 1.4 per cent under the June, 1957 figure. At the end of the first six months of 1957 glass container manufacturers have produced a preliminary total of 72,278,000 gross. This is 2.1 per cent over the 70,763,000 gross produced during the corresponding 1956 period.

Shipments of glass containers during June, 1957 were 12,309,000 gross, or a decrease of 4.2 per cent from May, 1957 shipments which were 12,851,000 gross. Shipments during June, 1956 were 12,248,000 gross or 0.4 per cent under June, 1957. At the end of the first months of 1957 shipments have reached a total of 67,937,000 gross, which is 0.5 per cent over the 67,563,000 gross shipped during the corresponding period last year.

Stocks on hand at the end of June, 1957 were 17,860,000 gross. This is 2.4 per cent above the 17,439,000 gross on hand at the end of May, 1957 and 10.7 per cent higher than the 16,130,000 gross on hand at the end of June, 1956.

Automatic tumbler production: During May, 1957 this production was 5,792,000 dozen this is a gain of 8.1 per cent from the May, 1956 production which was 5,359,000 dozen.

Shipments during May, 1957 fell to 5,148,000 dozen. This is 4.6 per cent lower than the 5,398,000 dozen shipped during May, 1956. At the end of the twelve months period ending May 31, 1957, shipments have reached a total of 55, 378,000 dozen which is 9.1 per cent lower than the 60,912,000 dozen shipped last year.

Table, kitchen and household glassware: Manufacturers' sales of machine-made table, kitchen and household glassware during May, 1957 reached 2,724,000 dozen. This is .5 per cent under the 2,755,000 gross of May, 1956. At the end of the twelve months period ending May 31, 1957, manufacturers had sold a total of 34,428,000 dozen, which was 5.8 per cent lower than the 36,553,000 dozen sold during the corresponding period last year.

R. E. GRAHAM NAMED GENERAL MANAGER

Robert E. Graham, elected a vice president of Owens-Illinois Glass Company, has been named general manager of the company's glass container division, east. Since 1955, Mr. Graham has been manager of the glass container sales office in New York.

In the new position, effective September 1, Mr. Graham will be responsible to C. G. Bensinger, president of the glass container division, for management of sales and manufacturing operations east of the Rocky Mountains. These include sales branches in 38 cities and the 10 glass container manufacturing plants in Illinois, Indiana, Texas, West Virginia, Pennsylvania, New Jersey, and Georgia.

R. E. Graham

Under Mr. Bensinger's direction, other operations of the Glass Container Division will continue to be carried on under H. S. Wade, vice president and general manager of the Pacific coast division, with headquarters in San Francisco, and George S. Babcock, vice president and general manager of the closure and plastic division, whose offices are in Toledo.

"Election of Mr. Graham as a vice president and his appointment as general manager of the Glass Container Division is part of a series of organizational moves designed to increase the company's ability to compete successfully in today's markets, and to realize greater sales potentials resulting from enlarged manufacturing capacity," Mr. Bensinger said.

Mr. Graham joined Owens-Illinois in 1934, and has held various sales posts since 1942, when he was appointed a salesman in the New York branch of the glass container division. He was named food industries sales manager in New York in 1949, and from 1952 to 1955 was processed foods sales manager and then assistant manager of food industries sales in O-I's Toledo general offices.

A native of Clarion, Pa., Mr. Graham is a graduate of Georgetown University. Prior to his sales assignment, he held various manufacturing posts in the company's plants in Charlestown, W. Va., Alton, Ill., Muncie, Ind., and Bridgeton, N.J.

ANNOUNCEMENT OF NEW PUBLICATION

Standard Samples and Reference Standards issued by the National Bureau of Standards, National Bureau of Standards Circular 552 (second edition), 24 pages, 25 cents. (Order from the Superintendent of Documents, Government Printing Office, Washington 25, D. C.) The Circular is also available without charge to prospective purchasers of Standard Samples, upon request to the National Bureau of Standards.

This Circular contains an up-to-date descriptive listing of the various Standard Samples issued by the National Bureau of Standards and supersedes Circular 552 issued in August 1954. A schedule of weights and fees, as well as direction for ordering, is included. Summarized tables of analyses are presented to indicate the type of standards of composition presently available. The current status of the various standards will be indicated by a mimeographed insert.

The NBS program on standard samples has been in existence almost since the organization of the Bureau. The first standards were prepared in 1905, and today over 500 different standard samples of chemicals, ores, ceramics, and metals are prepared, certified, and distributed by NBS. They are used in industrial and research laboratories to control manufacturing processes and in evaluating the accuracy of apparatus and equipment.

The standard samples are materials that have been carefully analyzed, or whose physical properties have been precisely determined, at the Bureau and other laboratories

Note: Foreign remittances must be in U. S. exchange and should include an additional one-fourth of the publication price to cover mailing costs.

PROMOTIONS AT L.O.F.

H. Matthew Bowers, general quality control manager of the L.O.F. Glass Fibers Company, Toledo, has been promoted to process control manager of the company's Corrulux Division, Houston, Texas.

His Toledo post will be filled by John R. Meeker who has been the supervisor of quality control at the Defiance (Ohio) plant, according to J. H. Plummer, vice president in charge of manufacturing and engineering.

Mr. Bowers, before joining the company in 1955, had been a research and analytical chemist with Libbey-Owens-Ford for six and a half years. Prior to that, he was associated with Westinghouse Electric and Manufacturing Company, Wheeling Steel Corporation, and was a school tacher and coach in Wetzel County, West Virginia.

Mr. Meeker was in the sales service division of Hewitt-Robins Inc. before joining L.O.F. Glass Fibers. Previously, he was associated with Bingham-Herbrand Corporation for four years as supervisor of quality control and the Toledo Edison Company for five years as supervisor of maps and records.

J. S. SCONCE IN NEW POSITION AT HOOKER

James S. Sconce has been appointed to the new position of technical assistant to management at Hooker Electrochemical Co., Niagara Falls, N.Y., according to Dr. Earl L. Whitford, vice president. Mr. Sconce has been manager of chemical research.

Born in Sidell, Illinois, Mr. Sconce received the bachelor of science degree from the University of Illinois in 1928. After being a research chemist with Cornstalk Products Company for two years, he joined Hooker as a research chemist in 1930, became a research supervisor in 1942, manager of research in 1950, and manager of chemical research in 1956.

• Dr. Marion B. Geiger has been appointed director, general development of Hooker Electrochemical Company, Niagara Falls, N. Y., it is announced by Thomas E. Moffitt, executive vice president.

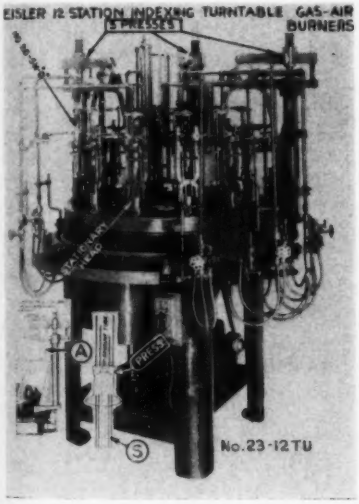
Dr. Geiger has been general manager, Oldbury Products since the consolidation of Oldbury Electro-Chemical Company into Hooker last November 30.

New Equipment and Supplies

NEW TIPLESS STEM MACHINE

Eisler Engineering Company, 742 South 13th Street, Newark 3, N. J., has developed a new type of tipless stem machine. This 12 head machine can make tipless stems (S) for the radio tube as well as incandescent lamp industry, by simply adding to the machine, an auxiliary clamping or pressing arrangement. (A) On larger tubes it is necessary that a number of heats and an additional number of press positions are supplied in order to make a good press (A).

This auxiliary pressing arrangement permits, without any change to the machine, an addition of as many press positions on the machine as are necessary to press large stems.



Machine #23-12TU has three press positions. Each one is individually adjusted and thereby permits an exceptionally large stem to be pressed.

Figure S shows a tipless radio tube stem. At the place marked "Press" a stem of this type could not be pressed in one position or with one pressing. In order to make this press so it will not crack when it is completed, it has to be pressed and re-heated several times.

Figure A shows a clamping arrangement that is attached to the machine. The machine can index 400 to 500 per hour and it is possible to take off 400 stems per hour. The production depends upon the nature of the glass. Hard and soft glass stems can be made on this stem machine. The stem head, having no individual press jaws, allows convenient adjustment and spacing of the burners. The machine is provided with gas-air-oxygen manifold mixers and burners.

The machine requires 1/3 HP motor and occupies 3½ x 3½ x 5′ of floor space.

This machine produces tipless stems of a novel type. The exhaust tube goes through the stem press and the exhaust tubing is kept open by means of a pin moving in and out while the glass is plastic. With this method, small and very large stems can be produced.

DIAPHRAGM METER

The Foxboro Company, Foxboro, Mass., has announced their new Type 37 diaphragm meter. The meter uses preformed highly sensitive diaphragms, stacked to nest together for positive overrange protection to full static pressure, it is claimed. The meter, designed for accurate flow measurement, is said to present a new concept in mercuryless meter design.

Each pair of diaphragms forming the low pressure (range) and high pressure (compensating) diaphragm elements is welded at the outer circumference and to opposing faces of a series of spacing rings at the inner circumference. Overrange pressure on either element forces filling fluid through a connecting passage, around an adjustable damping plug and into the opposite element. The unit under pressure compresses so that the spacing rings form a metal-to-metal column and each pair of diaphragms is nested, preventing overrange damage.

Measurement is unaffected by temperature variation of the liquid in the elements. A bimetallic compensator inside the high pressure element varies the fluid capacity of the element according to temperature changes.

The low pressure element, working against a thermally stable range spring, is connected to a bellows-sealed drive arm which operates through an Elgiloy metal flexure to drive the indicating or recording mechanism.

Differential ranges are 0-20, 0-50, 0-100 and 0-200 inches of water. Meter is available in rectangular or circular case, yoke or flush mounted, for 2000 psi maximum pressure. Diaphragms are of Type 316 stainless steel; body is of forged steel, cadmium plated or Type 316 stainless steel; range spring of Ni-Span C metal; and end caps of forged steel, cadmium plated or forged Type 316 stainless steel. Pressure connections are tapped for ¼ or ½ inch NPT, optional by turning the end caps.

TRANSISTOR HEADER MACHINE PRODUCED

Kahle Engineering Company, 1400 Seventh Street, North Bergen, N.J. has introduced a machine that is said to produce quality metal-flanged stems for transistors and similar components. This transistor header machine produces up to 800 units per hour.

Incorporating twelve heads with individual upper and lower molds, the machine differs from the standard all-glass subminiature stem machine in that each head position utilizes a precise die that correctly positions and holds the metal flange or ferrule. Unloading is automatic.

The transistor header machine can be supplied in a wide selection of types and capacities with or without automatic programming. It features the Kahle indexing mechanism for reliable production and a dual motor drive.

CATALOGS RECEIVED

Fisher Scientific Company, 498 Fisher Building, Pittsburgh 19, Pa. announces the newest edition of the Fisher Manual of Laboratory Safety. The compact pocket size, fully illustrated manual covers accident prevention, first aid, fire prevention, and safety equipment, and concludes with a safety bibliography. It includes a section on handling radioactive materials, as well as the use of isolation units for hazardous microbiological and clinical procedures. Free copies are available as a service to laboratories and clinics.

The Exact Weight Scale Company, 944 W. Fifth Avenue, Columbus, Ohio, offers a new eight-page brochure on their Shadograph Scales designed for use in industry. It contains illustrations, detailed specifications, and important features of 34 different models, ranging in capacities from 2000 MG up to 100 pounds. Write for Form 3333.

J. H. France Refractories Company, Snow Shoe, Pa., has announced the issuance of a new bulletin detailing information of their new France V-44 Surface Seal. In addition to information on use, technical data, application, shipping, storage, etc., the new bulletin explains the special features that claim the product to be a true "seal" which literally becomes a part of the masonry itself. Copy of the bulletin and specific technical information will be furnished on request.

Clipper Manufacturing Company, 2800 Warwick, Kansas City 8, Mo. announces that two new descriptive brochures in color are now available on their complete line of masonry saws. Brochure 2019 describes Clipper's completely new 2 horsepower Supermatic Saw; and the original Select-a-Notch 1½ horsepower masonry saw is defined in brochure 2021. Both may be obtained by writing to the company, Suite 167.

Silicone Lubricants . . .

(*Continued from page* 440)

3—Smoke, soot and dirt were greatly decreased around the machine.

4—The blank mold swabbing interval was increased from 10—20 minutes to 1—6 hours.

5—Blank mold changes were greatly reduced.

6—The gob speed was increased because of the excellent lubrication provided by the silicone in delivery equipment.

7—Shear blades were not changed at all during the two week run.

8—The machine was run completely on silicones at a cost comparable to charges for oil and dry delivery. Cost was $4.32 per twenty-four hour day.

9—The PerCent Pack* was improved or retained at normal levels.

$$\text{*PerCent Pack} = \frac{\text{no. bottles packed}}{\text{no. gobs delivered to the blanks}} \times 100$$

W. R. BECK CHAIRMAN OF NEW MINNESOTA SECTION OF A.C.S.

W. R. Beck of Minnesota Mining & Manufacturing Company has been elected chairman of the newly formed Minnesota Section of the American Ceramic Society. Other officers are: I. J. McKeand, Minneapolis Honeywell Regulator Company, Chairman elect; J. K. McLaughlin, Red Wing Potteries, vice chairman; N. H. Stradley, Minnesota Mining & Manufacturing Company, secretary; M. P. Bauleke, Minneapolis Honeywell Regulator Co., treasurer; and Hans Thurnauer, Minnesota Mining & Manufacturing Co., counselor. Beck said membership in the new group is open to residents of Minnesota and surrounding states who are engaged in the ceramic arts and sciences.

J. E. BRINCKERHOFF ELECTED PRESIDENT OF REFRACTORIES INSTITUTE

J. E. Brinckerhoff, vice president of The Babcock & Wilcox Co., New York City, was elected president of The Refractories Institute, at the annual meeting of the Board of Directors and membership held at The Greenbrier, White Sulphur Springs, W. Va. on June 27-28.

Mr. Brinckerhoff was born in New York City and graduated from Cornell University in 1917 with a degree in mechanical engineering. During World War I, he served in France as a U.S. Army Captain of Field Artillery. Mr. Brinckerhoff has been with B&W since 1918, serving in various capacities in the refractories division of the company.

The Refractories Institute is a national trade association of refractories manufacturers in the United States, Canada and Mexico.

W. E. S. TURNER TO VISIT U. S.

As this issue goes to press, Dr. John C. Hostetter advises THE GLASS INDUSTRY that Professor W. E. S. Turner has written to say that he will sail for Montreal, Canada on September 4. After his Canadian tour he will enter the United States for an extended visit during which he hopes to see several glass plants and arrange to attend the Glass Division Meeting of the American Ceramic Society in Bedford Springs, Pa. October 17-18.

ANCHOR HOCKING DOUBLES CAPACITY AT FLORIDA PLANT

Completion of major plant construction and addition of new equipment and machinery has doubled the production capacity at the Jacksonville, Florida plant of Anchor Hocking Glass Corporation it has been announced by Wm. V. Fisher, president, from company headquarters at Lancaster, Ohio.

The most recent addition at the Jacksonville plant involves new steel and concrete buildings covering 97,000 square feet of floor space. Included is new plant construction which houses a new furnace, glass container forming machines, lehrs and other equipment. The construction contract also included a new warehouse, the second for this plant, in anticipation of the need for added handling and temporary storage facilities when the plant addition gets into full production. The plant office area has been enlarged by fifty per cent.

The Anchor Hocking glass factory at Jacksonville was acquired in August, 1954 by purchase from the late Mr. Antonio Scalise who had constructed the plant about 1927. It was purchased from Mr. Scalise by the Tropical Glass & Box Company, a Florida Corporation and a wholly-owned subsidiary of Anchor Hocking Glass Corporation.

COST OF LABOR RISES IN CANADIAN GLASS INDUSTRY

Canada's glass industry is continuing to find labor costs moving up to affect prices and costs of operation, according to the latest nationwide survey by the Canadian government which reveals that the glass and glass products industry employed 7,670 on April 1, 1957 and their average weekly wages and salaries climbed to $68.84 from $68.02 a month earlier and $67.65 last year.

The average hourly earnings in this industry reached 153.5 cents on April 1 from 152.8 cents a month earlier and 152.4 cents a year ago, with the average hours of work per week dropping to 42.5 on April 1 from 42.9 last year on same date.

However, the employment was down to 123.5 on April 1 this year in contrast to 134.1 a year earlier, based on 1949 being 100. In addition, the proportion of male employees increased since, of the 7,670 employees on April 1, men comprised 6,360 and women 1,310, or men 82.9 per cent and women 17.1 per cent, whereas a year earlier men formed 82.4 per cent and women 17.6 per cent of the labor force.

TEACHING UNIT AVAILABLE

"The Story of Glass Containers", a teaching unit published by the Glass Container Manufacturers Institute, Inc., will again be available to teachers during the school year of 1957-58, it has been announced.

The 16-page illustrated booklet tells the history of glass containers from prehistoric days to the present time. Special emphasis is placed on America's first "glass house" in the Jamestown Settlement. In addition, the unit explains how glass bottles have helped to chart ocean currents, and describes modern methods of manufacture plus the part they play in modern life. Suggested activities, an outline for an assembly program, and a bibliography are also included.

Platinum Metals in Glass . . .

(*Continued from page* 442)

fraction data for sodium phosphate.

In a molten glass system it is normally thermodynamically impossible for separation in two phases to occur, but in the presence of platinum nuclei one phase is preferentially adsorbed and the free energy of the system is thus sufficiently lowered for the size of these adsorbed groups to grow and for phase separation to occur. The nature of the phase adsorbed on the platinum was investigated by studying the effect on the concentration of platinum needed to produce crystalliisation of altering the ratio of Na_2O to P_2O_5 in the melt. It was found that as this ratio increased from 0.89 to 1.2 the concentration of platinum required to produce crystallisation decreased from 0.05 to 0.0005 per cent. This can be explained if the liquid phase which separates out through adsorption on the platinum particles is richer in P_2O_5 than the remainder of the melt.

Photosensitive Glasses

Nucleation by palladium leading to crystallisation is made the basis for a photosensitive glass process in a patent taken out by Stookey[12] for the Corning Glass Works in 1950. Palladium and either silver or gold are introduced into the glass as sensitising agents and it is desirable, though not essential, that cerium and antimony oxides be also present. If this glass is exposed to ultraviolet radiation, it develops a brown colour on subsequent heating at a lower temperature than it otherwise would if untreated. If the exposure is made through a photographic negative, a brown photographic image can be obtained in the glass by heat treatment at a suitable temperature. This discovery adds usefully to the colour range of photosensitive glasses. A normal concentration of palladium is about 0.01 per cent and the optimum concentration for gold or silver is about 0.02 per cent. A variant of this process involves the addition of an amount of Na_2SiF_6 to the glass melt giving sufficient fluorine to produce on heating an opal background to the picture.

Another patent[13] covers the use of ruthenium dispersed in glass to produce red and black coloured glasses, glazes and enamels. Lead borosilicate and lead silicate glasses containing ruthenium take on pink to reddish-black colours, whereas with all other glasses ruthenium gives a true black coloration. The value of the latter lies in the fact that it gives equivalent absorption of transmitted and reflected light at all wavelengths in contrast to commercial black glass produced in the normal way by dissolving several oxides to give overlapping absorptions at various wavelengths. Both the red and black colorations are obtained by mixing the desired concentration of ruthenium, preferably as its oxide, with the molten glass or enamel. A brown ceramic stain is also described in which ruthenium or its oxide is fused with, for example, titania or thoria.

Practical Aspects

The study of these effects is of more than theoretical interest. The mechanism of colour formation is of obvious importance in the manufacture of decorative glasses, but it is equally of interest to the maker of dense, colourless glasses. In the manufacture of optical glasses and of dense glasses for radiation shielding, platinum is, on nearly every count, the best container material, even for high-lead glasses. Although it is only when they contain alkali that colour is developed in these glasses by traces of platinum, any work which will lead to an understanding of the conditions in which the colour formation may be suppressed is of considerable practical importance in the glass industry.

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DECHEMA PUBLISHES ANNUAL REPORT

Dechema Deutsche Gesellschaft für chemises Apparatewesen, of Frankfurt (Main), announces publication of their Annual Report for 1956. The report is 40 pages, written in German.

The first part of the report gives a full picture of the various activities of this society, which operates for the common good of its members in the field of scientific literature. It contains an account of the lectures organized by Dechema, the journals "Chemie-Ingenieur-Technik" and "Werkstoffe and Korrosion," the Dechema Monographs, the "Erfahrungsaustausch," the "Dechema-Werkstoff-Tabelle" (third edition) and other publications. It also gives information on the Dechema-Fachausschüssen which have been formed with the object of encouraging and fostering research and development in the various branches of chemical engineering and technical chemistry.

Dechema and the Max-Buchner-Forschungsstiftung, which is managed on an honorary basis by the former, contributed a sum of about DM 158,000.— to promote research and developments in 1956. The activities of the Max-Buchner-Forschungsstiftung are covered by the second part of the report. A grant of DM 57,550.— was made in 1956 towards the cost of 18 research programmes, the results of which are reported.

Dechema has continued its practice in previous years of reviewing papers published during 1955 on the fundamentals of chemical technology and kindred sciences. The report concludes with a list of DIN Standard Specifications which have been drafted in collaboration with DECHEMA. The publication is available free of charge on application to Dechema Deutsche Gesellschaft für chemisches Apparatewesen, Frankfurt (Main) 7, Postfach.

Russian Translations . . .

(*Continued from page 444*)

10.5, and PbO 27.5 per cent, was made in one of these pots, the inside of the pot became coated with a dark film (of a thickness up to 3 mm.) consisting chiefly of corundum grains, β-silica, and alkali alumosilicates with the refractive index 1.509 ± 0.004. These silicates probably belonged to leucites and carnegietites ($K_2O.Al_2O_3.4SiO_2$ and $Na_2O.\ Al_2O_3.2SiO_2$). Sometimes, parts of this film broke loose and formed stones in the final glass.

The film protected the refractory from the corrosive action of the melt. Thus, a type A pot, which initially had walls 9.5 cm. thick near the top and 11.0 cm. thick near the bottom, was reduced in thickness by 52 melting operations of the above glass to 8.0 cm. and 10.5 cm. near the top and bottom, respectively, while the two thicknesses were 3.5 cm. and 9.0 cm., respectively, after 52 meltings of a glass containing SiO_2 74.5, CaO 8.5, Na_2O 16.0, and K_2O 1.0 per cent. In the last mentioned glass, the dark film did not appear, and if a film existed from a previous melt, it disappeared in the soda-rich glass.

To make the effect of Na_2O and K_2O clearer, three glasses were made in type B crucibles. All of them contained 65 per cent SiO_2 and 20 per cent PbO. In addition, glass 1 had 2 per cent Na_2O and 13 per cent K_2O; glass 2 had 7 per cent Na_2O and 8 per cent K_2O, and glass 3 had 4.5 per cent Na_2O and 10.5 per cent K_2O. After melting, glass 1 was contaminated with many alumosilicate stones and left a dark coating on the crucible. Glass 2 corroded the crucible more than did glass 1, but contained striae rather than stones. Glass 3 gave the best results: it caused formation of a protective coating but neither stones nor striae were present in it.

The best ratio of Na_2O to K_2O depended on the other constituents of the glass and on the composition of the refractory. Thus, in a type A pot, a glass consisting of SiO_2 57 per cent, PbO 28 per cent, Na_2O 4 per cent and K_2O 11 per cent was made. After 7 operations stones appeared in the glass. When the alkali content was changed to Na_2O 5 per cent, K_2O 10 per cent or Na_2O 6 per cent, K_2O 11 per cent, the stones disappeared and acceptable glass was obtained in 65 per cent yield.

In consequence of the above study, the Leningrad Manufacture of Art Glass changed the composition of its production lead glass from

SiO_2 58 per cent, Na_2O 3 per cent, K_2O 14 per cent, PbO 25 per cent

to

SiO_2 57 per cent, Na_2O 4 per cent, K_2O 11 per cent, PbO 28 per cent

Determination of The Modulus of Elasticity of Glass From Its Stress Birefringence

N. K. Dertev recommends, in *Steklo i Keramika* (Glass and Ceramics) *11*, No. 11, p. 5 (1954), to calculate the modulus of elasticity *(E)* of a glass from the photoelasticity of a small sample viewed in a microscope. A bar of, for instance, 30x0.45x0.25 cm. (that is 1.2x0.18x0.10 inch) is bent on a microscope stage so that the depth of the curve is at least 0.0025 cm. (or 0.001 inch). This depth δ is measured with an eyepiece micrometer. Then the birefringence of the bent sample is determined. If the difference between the two optical paths is Δ cm./cm., then the stress σ in the surface layer is Δ/k, if k is a constant of each glass, which must be determined separately. If the distance betwen the two supports on which the bar rests is a, and the bar thickness is h, then

$$E = \sigma a^2/4h\delta = \Delta a^2/4kh\delta.$$

The photoelastic constant k can be determined on large specimen of an identical glass with a polarimeter.

The precision of the result is limited chiefly by the measurement of δ which may be wrong by 0.0002 cm., i.e. 8 per cent of the measured length, if δ is 0.0025 cm. The E calculated refers to the glass surface (that is to a layer about 0.03 cm. thick); if the E of the bulk glass is known, the degree of surface hardening can be estimated. The modulus of elasticity of the glass in bulk also can be derived from the measurements of photoelasticity but the procedure is less simple than that reported above.

Molten Quartz As A Refractory Material

K. T. Bondarev in *Steklo i Keramika* (Glass and Ceramics) *11*, No 10, p. 24 (1954), points out that the resistance to chemical attack by the glass melt is not the only requirement which a refractory block must satisfy; it is equally important that the products of this attack should be completely soluble in the melt without causing any stones, air bells, striae, and so on. From this point of view, quartz would be the ideal refractory material.

Blocks of mullite, "thermitocorund" (almost pure alumina), high-alumina fireclay, kaolin, and molten quartz were inserted in a periodic action furnace in which a high-melting borosilicate glass containing 5 per cent alkali was made. The melting lasted 24 hours at 1600-1650°, and the working 7 hours at 1500°. After a 50-day test, the greatest corrosion amounted to 33 per cent for mullite, 8 per cent for "thermitocorund" and kaolin, 6 per cent for fireclay, and only 1 per cent for molten quartz.

Later, blocks of molten quartz were used in a production furnace for a year. The glass consisted mainly of SiO_2 75.0, Al_2O_3 0.5, CaO 8.5, and Na_2O 14.5 per cent. The corrosion of the blocks was about 2.3 cm. per month, that is about as rapid as that of the high-alumina fireclay. Thus molten quartz, which is better than the other refractories as far as glass defects are concerned, is at least as good as they in respect of chemical resistance to glass melt.

During their life, molten quartz blocks crystallize to α-crystobalite which has softening temperature of 1680°C. If α-crysobalite blocks are cooled below 300°C, α-crystobalite transforms into β-crystobalite with some loss of the mechanical strength of the block; but this loss will not affect production unfavorably.

• Appointment of Conrad R. Stemski as production superintendent of the Vycor Plant of Corning Glass Works was announced by the company.

Mr. Stemski joined the company in 1952 following graduation from St. Bonaventure University and since that time has been employed in the Apparatus Plant.

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NEW PLAN WOULD LINK TARIFF TO FOREIGN WAGES

A foreign trade plan that would equalize foreign and domestic competition for American markets while at the same time raise wages and living standards for workers abroad was recently proposed in a forum on world economics in Washington.

The plan, to base United States import duties on the relative wages paid to production workers here and abroad, was presented at the annual meeting of the American Institute of Architects by James M. Ashley, of Toledo, public relations director for Libby-Owens-Ford Glass Company and former national president of The Producers' Council.

Mr. Ashley was the representative of industry in the AIA panel on "The New World of Economics." Walter Reuther, president of Auto Workers, spoke for labor, and Dr. Emerson P. Schmidt, director of economic research for the United States Chamber of Commerce, represented that organization on the panel.

"Let United States import duties be based upon a formula which industry by industry and product by product will offset the extra production cost of workers' wages, if any, between the domestic industry and the exporting manufacturer," said Mr. Ashley.

"This system does not ignore the relative productivity of labor. Nor does it require a foreign manufacturer to pay the same scale of wages as his American competitors in order to have his product admitted duty free. It does require him to pull his weight in the boat as far as the economy of his own country is concerned."

America's prosperity has been built on the economic philosophy of paying sufficient wages to enable workers to enjoy the fruits of their labor, it was pointed out by Mr. Ashley. This policy, first espoused by Henry Ford in 1914, has created "our kind of capitalism," he said.

"But in 1957, all American producers face competition from firms outside the sphere of this concept of capitalism—firms which do not subscribe to the idea that the worker is the best of all possible customers—firms that pay what we would call sweatshop wages," he continued. "For the old, and in this country discredited, form of capitalism flourishes throughout the so-called free world, and state socialism with its corollary of slave labor flourishes behind the Iron Curtain.

"In our peculiar form of capitalism, we have a ringing answer to Communism. In Europe and in South America and in Asia, Karl Marx could still instantly identify his abused proletariat. But whom in this country would he so identify? Would it be the factory worker who drives a Pontiac with twin tail pipes, goes home to his own ranch house, takes his vacation in Yellowstone Park?"

Mr. Ashley pointed out that under the Fair Labor Standards Act, United States producers must pay a minimum wage of $1 a hour, but that some companies are taking advantage of our low import duties by transferring their operations abroad where labor is cheap. One such manufacturer, who pays an average wage of 48 cents an hour to have his products made abroad, sells all his goods in this country.

The current hourly earnings average of production workers in all United States manufacturing is $2.05, it was pointed out. Under the Ashley Plan, producers in foreign countries would be required to pay only a fair proportion of the amount paid by a comparable U. S. industry to obtain tariff benefits.

For example, in the case of one product cited by Mr. Ashley, in order to get the item admitted duty free a Canadian manufacturer would have to pay an average wage, including fringe benefits, of $1.69 an hour; a French producer, $1.33; Japanese, 79 cents. The closer they approached those figures, the lower their duty would be.

"By this system we would extend the American variety of capitalism abroad to the end that workers elsewhere will receive a fairer share of the product and increment of industry," Mr. Ashley said. "Only if the consuming power of peoples abroad is increased will the economy of the free world come to full flower.

"And human nature being what it is, increases in wages require tangible inducement—or palpaple threat—not preachment alone. Concessions which accrue to the benefit only of the wealthy and powerful have not substantially raised the level of foreign wages, nor is it likely that they will."

LITHIUM DISCUSSED IN NEW STUDY OF ALKALI METALS

Lithium, currently finding widespread use both as a metal and in various compounds, is one of the alkali metals discussed extensively in a new volume recently published by D. Van Nostrand Co., Inc., Princeton, N. J. The book is the sixth in a planned series of eleven volumes called "Comprehensive Inorganic Chemistry". Authored by Robert C. Brasted and John F. Suttle the volume is entitled "The Alkali Metals—Hydrogen and Its Isotopes". Mr. Brasted and M. Cannon Sneed are editors of the complete series.

In order to emphasize the differences between the various alkali metals—lithium, sodium, potassium, rubidium, cesium, and francium—these materials are discussed jointly in the unique 248-page work. Illustrated throughout with more than fifty comparative charts and tables, the book is a comprehensive study of the chemical properties, occurrence, preparation, alloys, properties in liquid ammonia, and analytical chemistry of these metals and their compounds. A noteworthy feature is the large number of phase and solubility diagrams of the various compounds of these elements.

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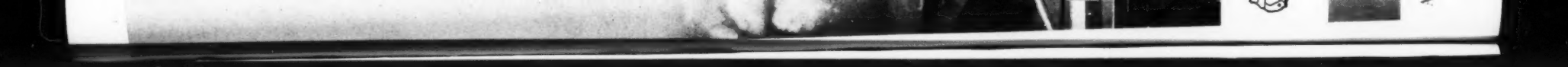

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TYPICAL ANALYSIS

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Na_2O	58.4%	57.5%
Na_2CO_3	99.85	97.6
NaCl	.02	.35
Na_2SO_4	.04	.70
$Na_2B_4O_7$	.05	1.20
COLOR	WHITE	WHITE
DENSITY	57-62 lbs.	53-55 lbs.

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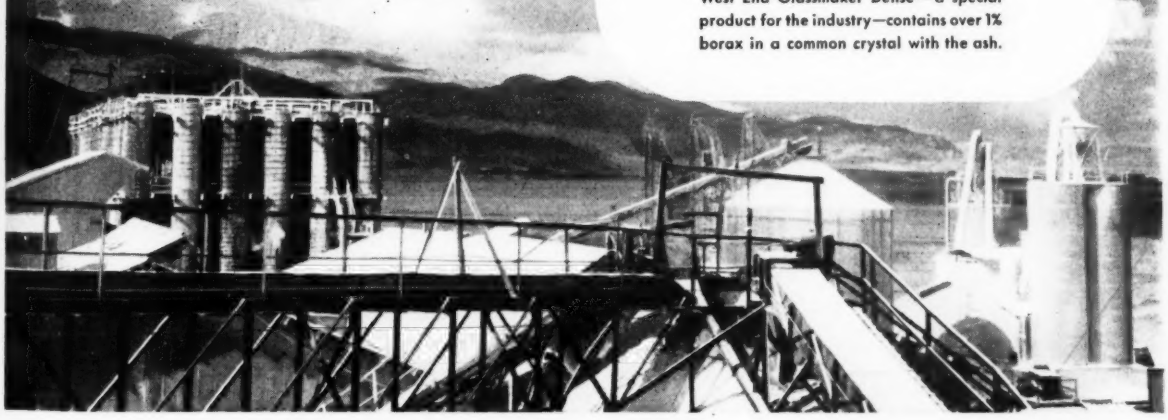

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FOUR PROMOTIONS AT OWENS-ILLINOIS

Promotion of four key production executives in the Glass Container Division of Owens-Illinois Glass Co. have been announced by Miles G. Beishline, vice president and division general factories manager.

Mr. Beishline said Floyd Flexon, manager of the O-I plant at Alton, Ill., since 1932, had been named to the new position of assistant to the general factories manager in the company's general offices at Toledo, O. He will be succeeded by Courtney Budd, manager of the Huntington, W. Va. plant, with D. B. Adams, now Clarion, Pa. plant manager, succeeding Mr. Budd, and James L. Sommerville becoming Clarion manager. Mr. Sommerville now is plant engineer at the Bridgeton, N.J. plant of Owens-Illinois.

All the promotions are effective August 1, Mr. Beishline said.

A native of Glassboro, N.J., Mr. Flexon joined O-I in 1918 at its plant in his home town. He was transferred to the Fairmont, W. Va. plant in 1926 as plant manager, a position he held until 1930 when he moved to Toledo as a scheduling supervisor and later as general factories superintendent. Mr. Flexon was transferred to Alton in 1931, and became plant manager there the following year.

Mr. Budd, who will be the new manager at Alton, is a native of Vineland, N.J., and graduate of the Wharton School of Finance and Commerce at the University of Pennsylvania. He began in O-I's General Engineering Department in 1931, and was named Clarion plant manager in 1939. Promoted to manager of the Columbus, O. plant in 1939, Mr. Budd became Huntington manager in 1946.

The new manager at Huntington, Mr. Adams, has been with O-I since 1941. He is a graduate of Ohio State University, and joined the company at the Columbus plant. Transferred to Toledo as an industrial engineer in 1947, Mr. Adams was promoted to chief industrial engineer for the Glass Container Division in 1952, and became Clarion manager last year.

Mr. Sommerville, who succeeds Mr. Adams at Clarion, is a native of that city and joined O-I in 1931. A ceramic engineering graduate of Pennsylvania State College, Mr. Sommerville was first a field representative specializing in combustion control. He was named plant engineer at Clarion in 1947, and was transferred to Bridgeton in the same capacity in 1953.

SHOEMAKER IS CORHART MANAGER

Donald W. Shoemaker has been named manager of manufacturing for Corhart Refractories Company, Inc., it was announced by Hugh L. Kline, president and general manager.

Mr. Shoemaker was formerly manager of the Corning Glass Works Refractories Plant at Corning, N. Y.

A native of Elmira, N. Y., Mr. Shoemaker received a bachelor of Science and Mechanical Engineering degree in 1939 from Purdue University. He joined Corning Glass Works in 1940 as plant engineer at the Fall Brook Plant in Corning, N. Y.

After World War II service in the navy, he became secretary and factory manager for Bardach Brothers, Inc., rejoining Corning Glass Works in 1950. He served successively as quality and process engineer at the Fall Brook Plant, production superintendent at the Danville, Ky., Plant, production superintendent at the Albion, Mich., Plant, quality and process engineer at the Albion Plant and manager of Corning's Refractories Plant.

LOUIS DIAMOND REJOINS FMC

New York City, June 28, 1957: Dr. Louis H. Diamond has resumed his post as senior project chemist on the research and development staff of the Westvaco Chlor-Alkali Division of Food Machinery & Chemical Corporation in South Charleston, W. Va., it was announced by Franklin Farley, Division President. Dr. Diamond served with the U. S. Army at Rocky Mountain Arsenal. He originally joined FMC in 1954, following receipt of the Ph.D. degree in chemistry from the University of Illinois.

LEAD RESEARCH STUDY INITIATED

As part of its continuing program of providing technical aid to industrial users of lead, the Lead Industries Association announced here that a study of research aims has been authorized. The contract with the Battelle Memorial Institute of Columbus, Ohio, is for a study on the "Evaluation of Research Needs and Formulation of a Research Program" for the lead industry.

The objectives of the study are to provide a guide for future research to be undertaken by the Association. Battelle will screen and evaluate possible research approaches, and will formulate a balanced program based on these findings.

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Inventions and Inventors . . .

(*Continued from page 448*)

the following: 33 per cent to 44 per cent SiO_2, at least one alkali metal oxide from the group consisting of K_2O and Na_2O, the total alkali metal oxide being between 4.5 per cent and 10.5 per cent, 37 per cent to 51 per cent PbO, 0.5 per cent to 6.0 per cent BaO, 0.5 per cent to 5.0 per cent ZnO, and 0.2 per cent to 1.0 per cent of a fining agent selected from the group consisting of As_2O_3 and Sb_2O_3, the remainder of the composition comprising compatible oxides selected from the group consisting of 0 per cent to 3 per cent TiO_2, 0 per cent to 1 per cent Ta_2O_5 and 0 per cent to 4 per cent Al_2O_3. The refractive indices for the D line (n_d) for our glass composition have a range of 1.61 to 1.69.

There were 5 claims and the following references cited in this patent: 1,943,051, Berger, Jan. 9, 1934; and 408,-993, Great Britain, 1934. Other references: Eitel et al., *Glastechnische Tabellen* (1932), pp. 316 and 677.

Glass Wool and Fiber

Attenuating Glass and Similar Fibers. Fig. 4. Patent No. 2,729,027. Filed November 22, 1950. Issued Jan. 3, 1956. 3 pages drawings. Assigned Owens-Corning Fiberglas Corp. by Games Slayter and Ed. Fletcher.

This invention relates to apparatus for forming and attenuating fine fibers from fiber forming materials and more especially to a method and apparatus for continuously forming and attenuating fibers of mineral material such as glass and gathering same into continuous strands, linear groups or bundles for use or further processing.

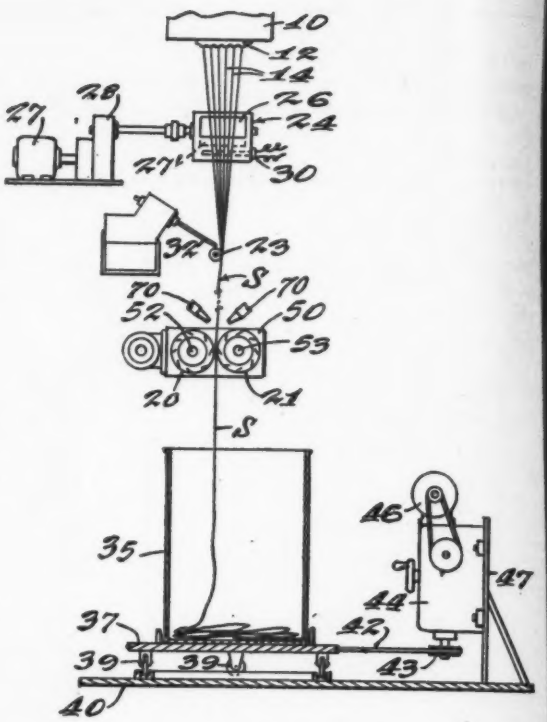

Fig. 4

Disposed beneath the supply receptable 10 (see Fig. 4) is a feeder bushing 12 provided with a comparatively large number of small openings or apertures through which flow streams 14 of the molten or flowable fiber-forming material (glass).

The streams 14 of fiber-forming material are directed into engagement with attenuating instrumentalities 20 and 21 which are preferably of a rotatable character and which simultaneously attenuate the streams 14 to fine continuous fibers which are gathered into a linear group or strand S and advance the same to a collecting zone. The fibers formed through attenuation of the streams 14 are converged or gathered together into a linear group or strand formation by means of a collector 23 which may be in the form of a grooved roll as illustrated or a V-shaped fiber gathering pad.

The continuous linear group of fibers or strand S passes between the moving attenuating instrumentalities 20 and 21, the strand being thereafter subjected to further processing operations or collected in a suitable manner dependent upon the subsequent use or processing of the fibers.

In order to provide for the application of sizing material, a receptacle 24, adapted to contain a sizing or coating material preferably of a type readily liquifiable under heat, is equipped with an applicator in the form of a roll 26 journalled in suitable bearings which is driven by a motor 27, through gearing contained in casing 28 whereby the applicator or roll 26 is rotated at a comparatively slow speed.

The apparatus enables the collection of the strand in various ways and more especially it provides for a free end of strand so desirable in carrying on further processing operations.

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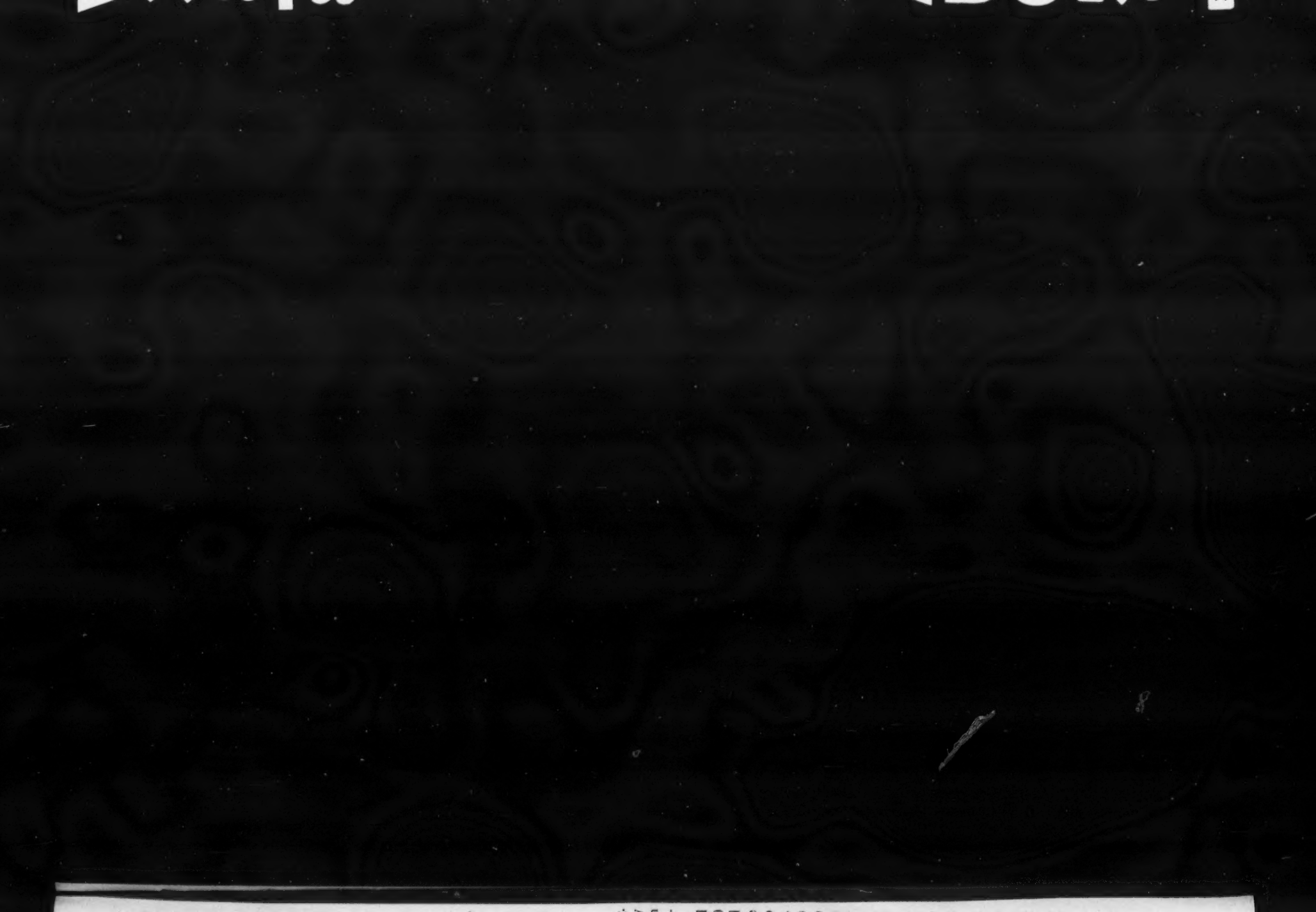

There were 8 claims and 18 references cited in this patent.

Simultaneously Attenuating and Severing Glass Fibers. Fig 5. Patent No. 2,729,028. Filed November 22, 1950. Issued Jan. 3, 1956. Two sheets of drawings. Assigned to Owens-Corning Fiberglas Corp. by G. Slayter and E. Fletcher.

Mineral fibers and especially fine fibers formed of glass in strand or linear configuration have been found to have particular utility when reduced to comparatively short lengths in producing bonded fibrous mats and for forming preforms, etc.

In carrying out the method by means of the apparatus of Fig. 5, the streams 14' of glass or other flowable fiber-forming material are attenuated to fine fibers by

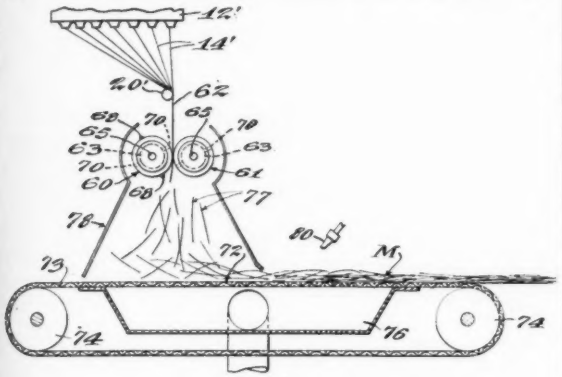

Fig. 5

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the attenuating rolls 60 and 61, the fibers being guided thereto in a linear group 62 by member 20′. It is usually desirable that the mat contain a large proportion of discrete or individual fibers disposed in haphazard assembly and hence no binder or adhesive is applied to the fibers entering the attenuating rolls. It may be advantageous to use water or water containing a small percentage of vegetable oil or a cationic material applied to the fibers at the guide 20′ to minimize the friction or abrasion among the fibers.

As the linear group of fibers is successively cut by the knives 68, the cut fibers are subjected to the blasts of air issuing from the passages 70 which are effective in separating the fibers, and facilitating the distribution of the separated fibers over the collecting surface. The air blasts also serve to direct the fibers in a generally downward direction. The turbulence set up by the air blasts forming zones of differential pressure facilitates the ultimate haphazard orientation of the fibers during accumulation into mat formation to secure a product that is fluffy and of relatively low density. The mat M is treated with binder from the applicator 80 and is subsequently cured in a suitable oven.

A suction chamber 76 is disposed adjacent the collecting surface 72 to facilitate the collection of the fibers and to set up a resistance to the withdrawal of the fibers during the formation of slivers or yarns therefrom.

There were 16 claims and 11 references cited in this patent.

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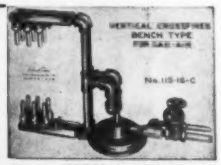

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Sheet and Plate Glass

Drawing Glass. Fig. 6. Patent No. 2,726,486. Filed May 17, 1949. Issued December 13, 1955. One drawing. Assigned to Union des Verreries Mecaniques Belges S. A., by Edgard Brichard.

This invention relates to the vertical drawing of sheet glass from a bath of molten glass and is directed to the provision of a process and apparatus for producing drawn glass in sheet form of generally improved appearance.

It is known that movement of relatively cold air along and in contact with the surfaces of the glass sheet while they still remain plastic, and with surfaces of the bulb that normally forms at the foot of the glass sheet as it is drawn from the molten glass bath, produces modifications in the characteristics of the glass which impair the final appearance of the glass surface.

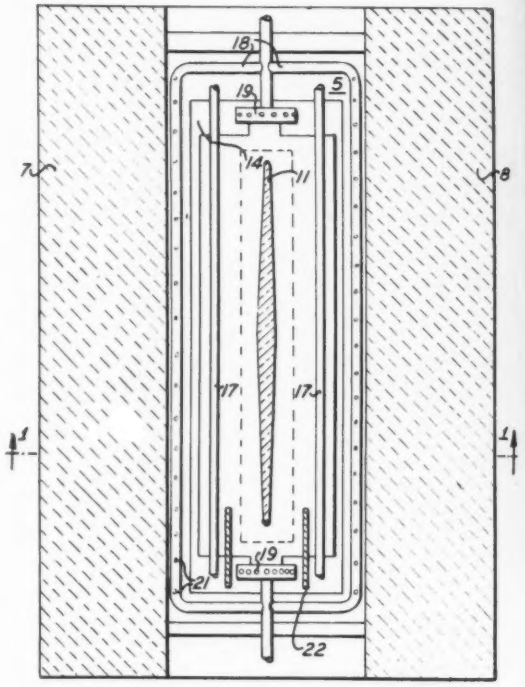

Fig. 6

A pipe 18 (See Fig. 6) is positioned along each side of the sheet near the level of the bulb but spaced laterally therefrom and generally parallel thereto. A pair of end pipes 19 are similarly spaced from the ends of the bulb. All the pipes 18 and 19 have small openings that extend along the length of the pipe. The pipes 18 and 19 are connected to an external source of suction, not shown.

Sufficient suction is applied through the pipes 18 and 19 so that the pressure of the gaseous atmosphere in the immediate vicinity of the pipes will be at least as low as the pressure immediately adjacent the base of the bulb, and will, therefore, cause the air from the base of the bulb to move laterally toward and into the suction pipes. This in turn will cause a current of air to move downwardly along each surface of the glass

(*Continued on page* 466)

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Inventions and Inventors . . .
(*Continued from page* 464)

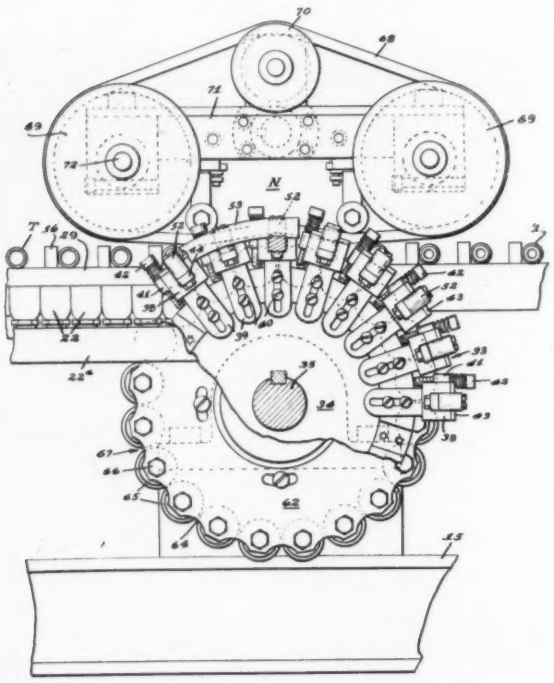


Fig. 7

sheet.

Although it is preferable to create enough suction in the pipes so that the normal upwardly-moving air currents along the surface of the sheet are reversed, it is sufficient if the lowered pressure at the suction pipes is just enough to eliminate the entry of cold air into the zone immediately adjacent the base of the glass sheet around the bulb. In other words, rising warm air currents or the absence of air currents does not impair the surface of the sheet.

There were five claims and the following references were cited in this patent: 1,816,037, Zellers, July 28, 1931; 2,287,136, Rolland et al., June 23, 1942; and 2,693,052, Brichard, Nov. 2, 1954.

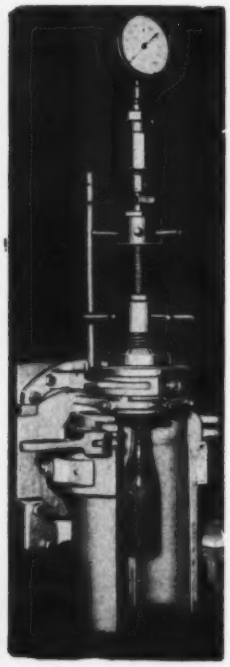
Tube and Cane Machines

Vial Necking Machines. Fig. 7. Patent No. 2,738,-622. Filed October 9, 1952. Issued March 20, 1956. 5 pages drawings. Assigned to Owens-Illinois Glass Company by Robert H. Koenig.

This invention relates to improvements in apparatus for forming necks on glass tubes incident to the production of vials.

Glass tubes, while advancing to the neck forming zone N, are rotated with one end projecting into a softening flame provided for by the burners 22. Thus, they are prepared for the neck forming operation. As these tubes enter the zone N, they are picked up by the elevating disks 62 and thereby carried to a position in register with the internal forming plugs 31 (not shown) which

(*Continued on page* 468)



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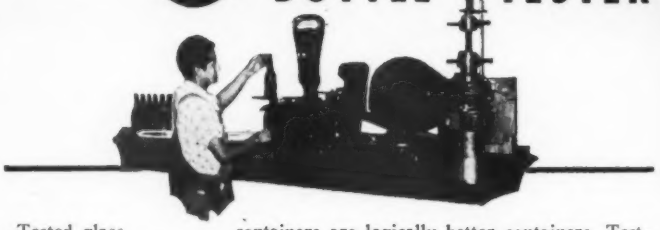

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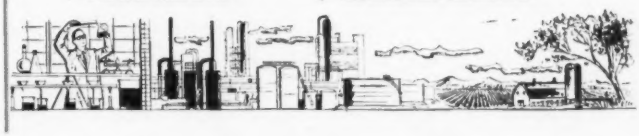

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Inventors and Inventions . . .

(*Continued from page* 466)

are quickly projected into the previously softened end. Rotation of the tubes while in contact with the plugs and external forming tool, reshapes the softened end as determined by the contour of the plugs and tool. Such neck forming is obtained while the tubes continue their advancing movement. As they leave the forming zone N, they are again lowered onto the conveying means.

There were twelve claims in this patent.

Flashing Glass Articles. Fig 8. Patent No. 2,744,034. Filed March 7, 1952. Issued May 1, 1956. One page drawings. Assigned Corning Glass Works by R. H. Dalton and R. O. Voss.

This invention relates generally to the manufacture of colored hollow glass articles and is particularly concerned with an improved method for making colored glass lamp bulbs and the like.

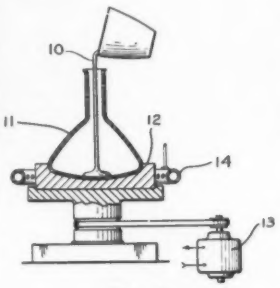


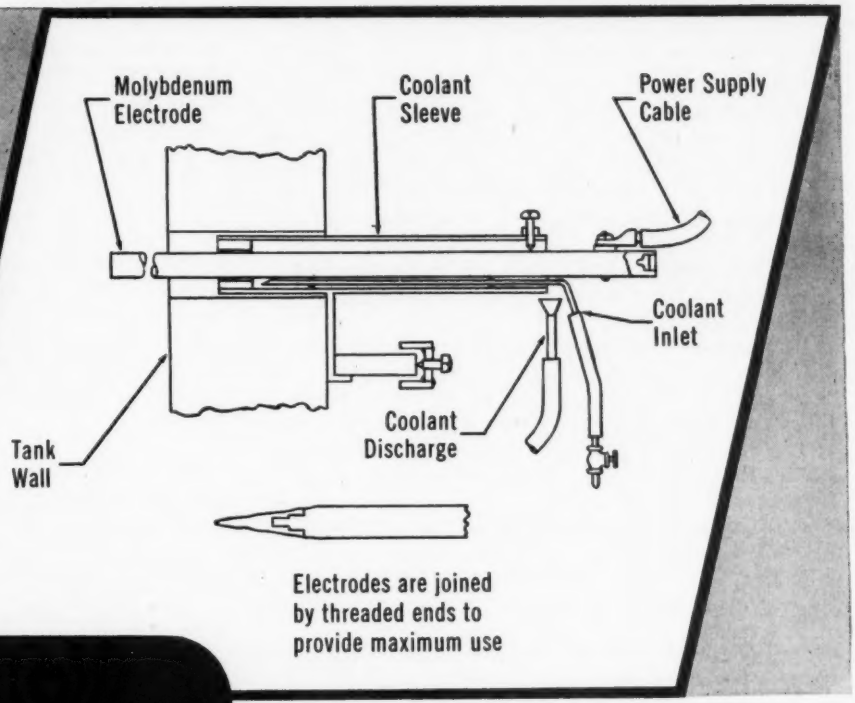
Fig. 8

Fig. 8 is a side view, partly in section, of an arrangement for introducing a desired quantity of a molten colored soft glass 10 into a preheated clear hollow glass article such as a lamp bulb 11 resting on a rotatable support 12 and for revolving the support and the article by means of a variable speed motor 13 to spread the molten glass 10 by centrifugal force. A burner 14 is provided to keep the support 12 and the article 11 at a suitable temperature.

In practicing the novel method the hollow glass article 11 (in this instance a lamp bulb having an average wall thickness of about 1mm. and a maximum diameter of about 12cm. and composed of a soda-lime silicate glass having a strain point of 478°C., an annealing point of 510°C., a softening point of 696°C. and an expansion coefficient of 92 x 10^{-7} per °C., between 0° and 300°C.), is preheated to a temperature between 480 and

(*Continued on page* 470)

Hot molybdenum ingots are forged into round billets, then further processed to make 1¼-inch diameter electrodes for glass melting furnaces using the Ponberthy electrode assembly shown in the diagram.



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Inventions and Inventors . . .

(*Continued from page* 468)

690°C. and is then placed on the rotatable support 12. About 20 to 30 g. of a molten colored glass having the specific base composition set forth below and heated to about 1,000°C. (viscosity about 1 poise) are immediately poured onto the center of the inner surface of the bulb 11 and the support 12 is rotated at first slowly and then at high speed until the molten glass has been distributed over the desired area of the inner surface of the bulb.

It is especially desirable for use with articles of a soda-lime silicate glass, consists approximately of 75 per cent PbO, 11 per cent Al_2O_3, 11 per cent B_2O_3 and 3 per cent SiO_2. Such base glasses may be colored by adding to their batches one or more of the coloring oxides, TiO_2, V_2O_5, Cr_2O_3, MnO_2, Fe_2O_3, Co_2O_3, Ni_2O_3, CuO, CeO_2, NdO_2 and UO_2.

There were five claims and the following references were cited in this patent: 1,870,363, Jenkins, Aug. 9, 1932; 2,539,410, Essig, Jan. 30, 1951; and 2,569,852, Green, Oct. 2, 1951.

• H. J. Carr, vice president and director of business research for Owens-Illinois Glass Co., has been enrolled as a member of the Business and Defense Services Administration's unit of the National Defense Executive Reserve in the Department of Commerce. He is one of 316 experienced business executives, most of them with prior government service, in the BDSA unit, according to Administrator H. B. McCoy.

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A "refuelling" contract for 5,000 nuclear fuel elements for the research reactor at Brookhaven National Laboratory, Upton, N. Y., has been signed with Sylvania-Corning Nuclear Corporation, it was announced jointly by Dr. Leland J. Haworth, director of the Laboratory, and Dr. Lee Davenport, president of the company.

Dr. Davenport said the Brookhaven contract was for the largest number of atomic fuel elements ever ordered on the commercial market for a non-military purpose. Totaling about a quarter of a million dollars, the order calls for deliveries of the fuel elements to begin this month and to continue at the rate of 500 per month for 10 months.

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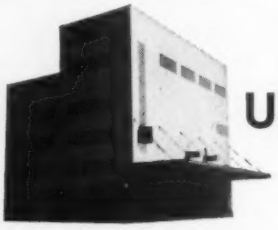
THIS IS THE  ULTRA-MODERN PLANT

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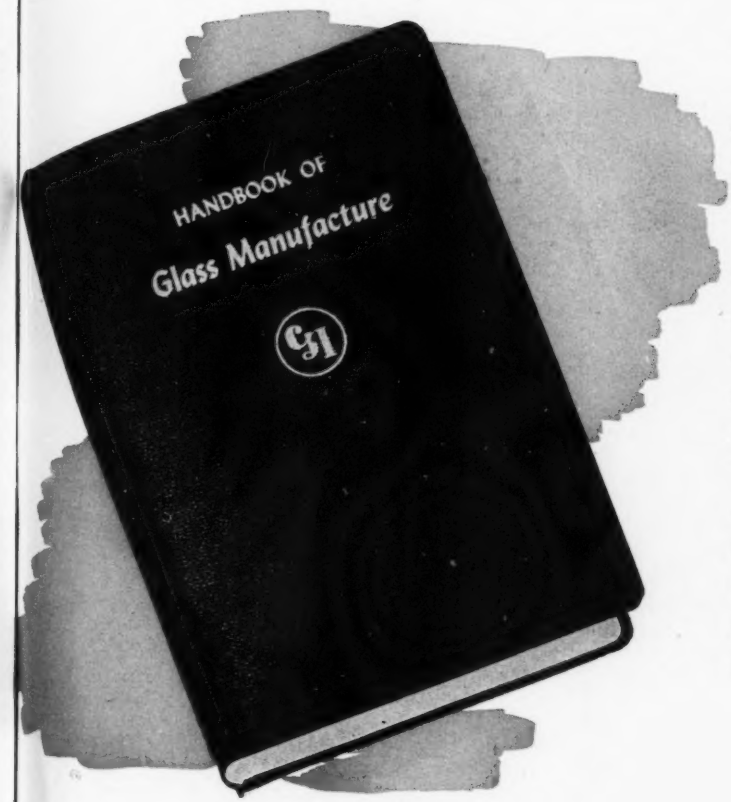

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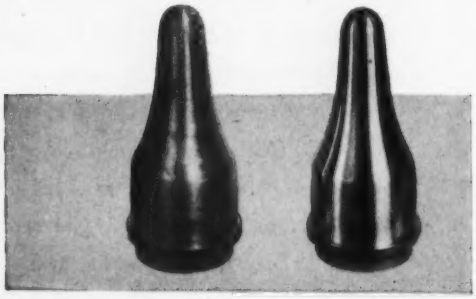

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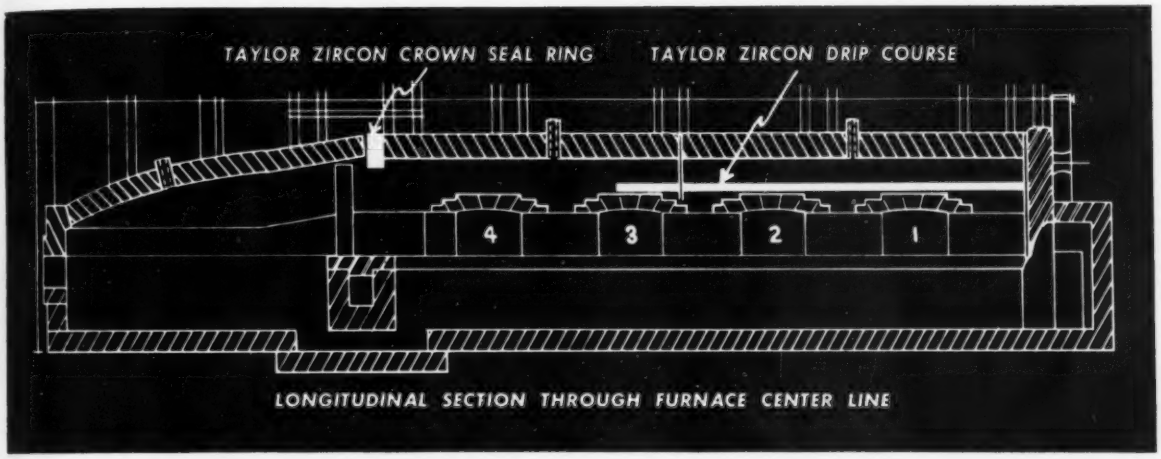
how Taylor Zircon solved a serious crown erosion problem



This diagram shows a four-port, cross-fired regenerative furnace operated by a major glass producer. In this furnace, concentrated erosion of the silica crown at the shadow wall and on each side of the tank adjacent to the crown skews, has always caused a high rate of ware rejection due to inclusions of cristobalite, tridymite and nephelite.

here's how the problem was solved:

1 **TAYLOR ZIRCON CROWN SEAL RING, located adjacent to the expansion joint in the crown where melter and refiner meet (see dicgram), proved a definite success. It provided an effective seal between melter and refiner; prevented a "sting out" from entering the refiner; completely eliminated the washing of the crown.**

2 **TAYLOR ZIRCON DRIP COURSES, installed on both sides of the furnace and extending from the back wall to the third port, prevented silica wash from eroding the high alumina breastwalls, ports and tuckstones.**

In many other furnaces, Taylor Zircon has been highly successful in reinforcing zones of silica crowns subject to excessive wear. See your Taylor field engineer, or write direct, for detailed information.

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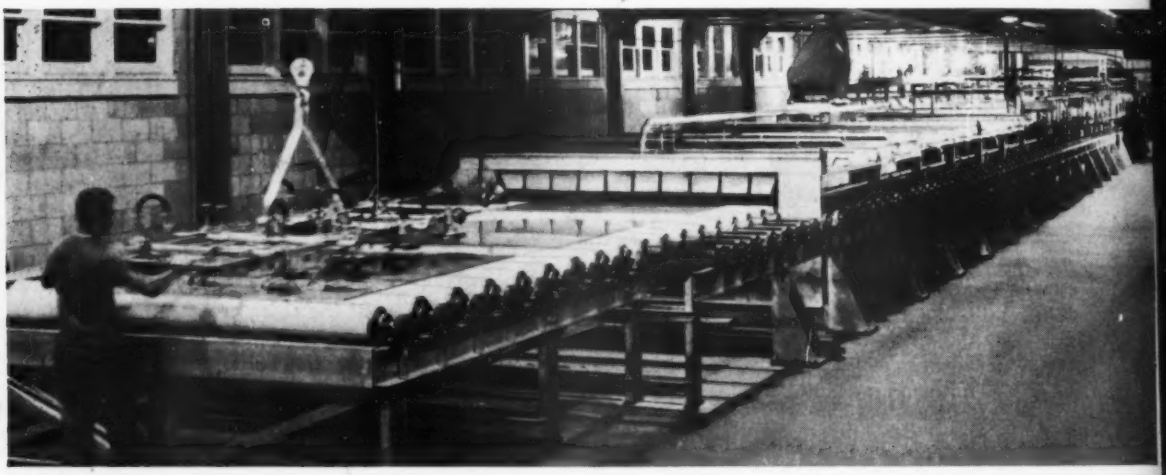
Sometimes only competition—from other materials and other countries—can force a manufacturer to recognize that his equipment belongs in a museum and his unit costs wear high-button shoes.

Fortunately, few managements need a crisis to remind them of the best cures for a case of competition. They consistently invest in process and product improvements, and in equipment which trims unit costs to competitive levels.

Because the investment yields gratifying returns, many companies regularly replace obsolete equipment with Surface Combustion lehrs, kilns, and ovens. The dependable productivity of these modern units is a pleasant antidote for competition.



A Surface Combustion continuous lehr for reannealing heavy sheet glass.

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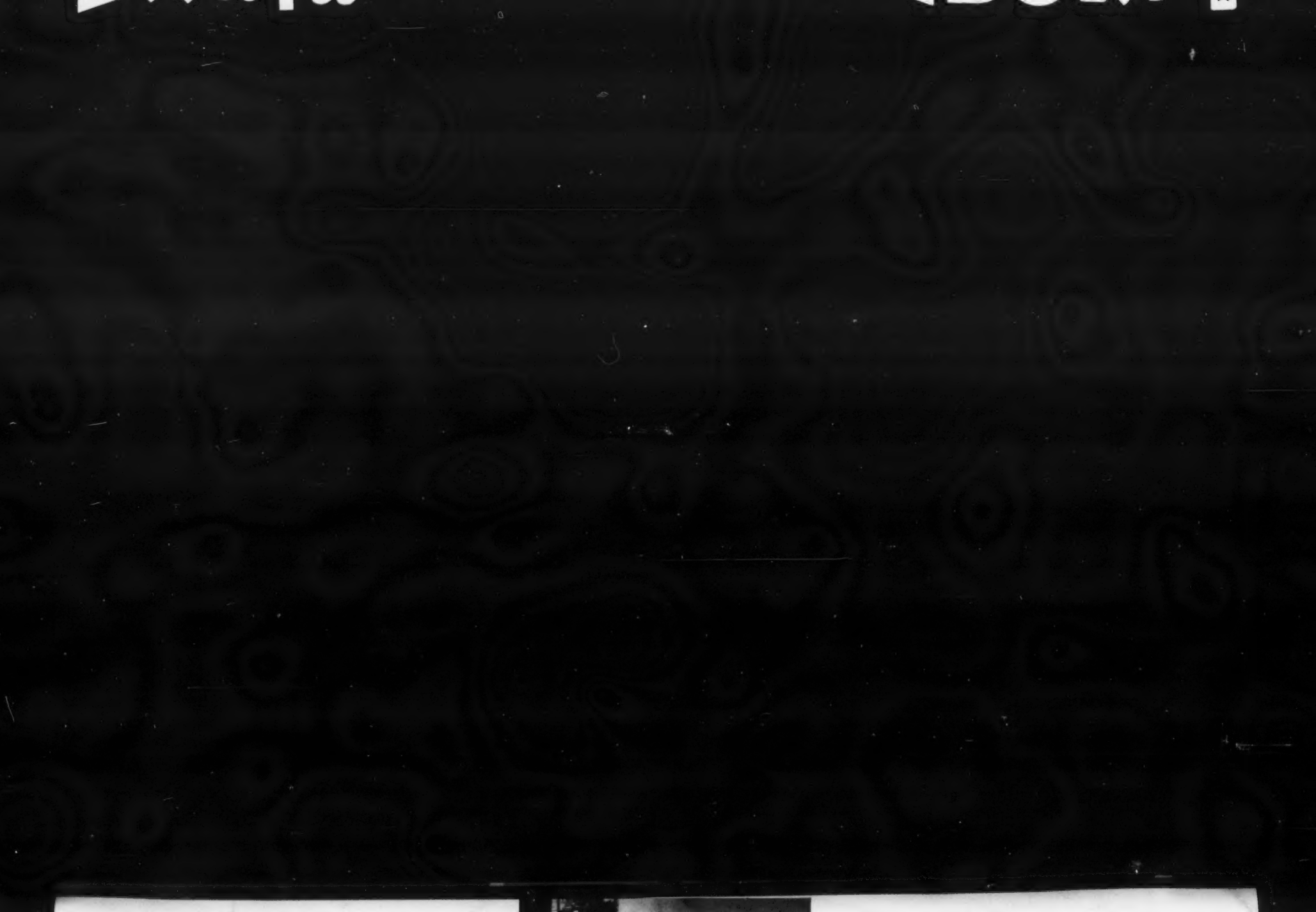
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